VEMBER CENTS

POPULAR MECHANICS MAGAZINE

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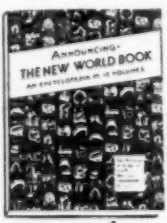

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Diver Leaving His Shell and Explaining the Position of the Safe Which Was Found in the Captain's Cabin of the Steamer "Egypt"; the Safe Yielded the Key to the Bullion Room

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Vol. 54 NOVEMBER, 1930 No. 5

Diving for $5,000,000

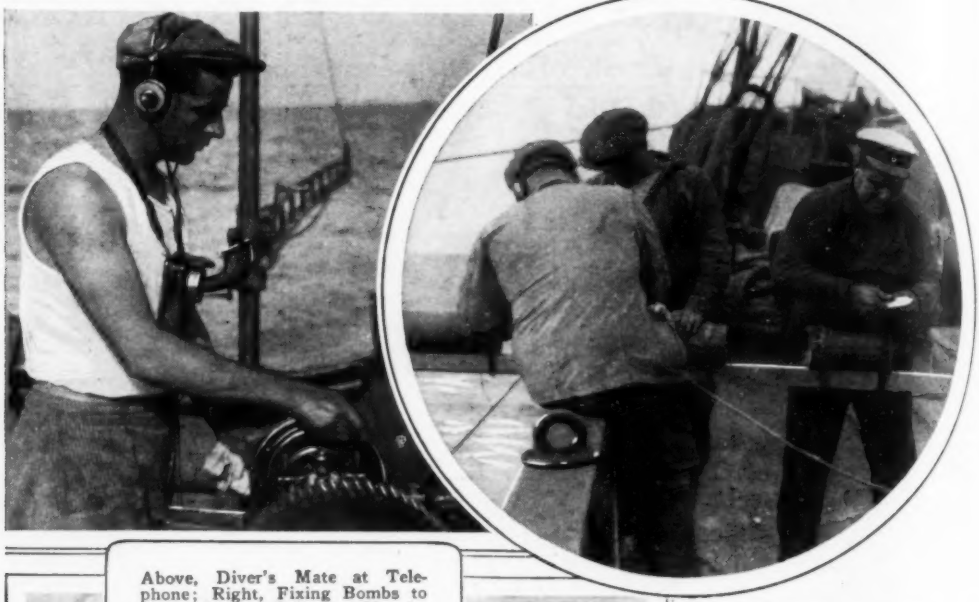
Observation Shell Being Hauled Aboard the "Artiglio," the Italian Ship Which Has Been Doing the Salvage Work; in This Shell, Because of the Almost Complete Darkness, the Diver Can See But Six Feet Ahead

ONE of the greatest treasure hunts of all time has resulted in the finding of the hull of the steamer "Egypt," which sank with a cargo of more than $5,000,000 in gold and silver. Italian divers, after months of perilous toil, have descended in 400 feet of water off Cape Finisterre, France, where the vessel went down in 1922 in a collision with another steamer.

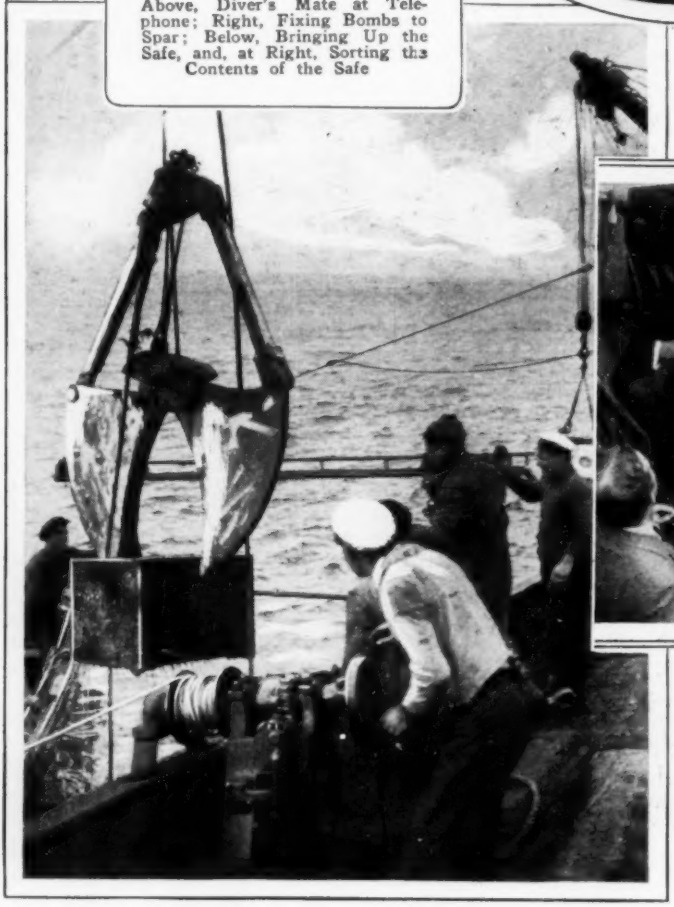
The ship's safe has been found, raised and opened. Among the articles was found the key to the bullion room where the treasure, in gold and silver bars, is believed to have been stored. Unfavorable weather halted operations temporarily.

The ship was found on the rocky ocean floor, about a mile from the spot where a previous unsuccessful search had been made in 1926. The hull was identified by its cranes, of a kind no longer used, and by tanks, insulators and other details that correspond to the "Egypt's" plans. It was lying upright on its keel. Divers from the Italian salvage vessel "Artiglio" slipped over the side in their metal chambers, and the work of investigating the wreck and seeking for the tons of precious metal, known to have been on the steamer, was under way. Tidal currents and fall storms made their task increasingly difficult.

One of the vessel's cranes was first located, lowered and hauled up to the deck of the "Artiglio." The captain's cabin was entered by tearing away the roof with grappling hooks let down from the salvage ship. The half-ton steel safe was found in the cabin, rusty and covered with sea growth after its eight years under the



Above, Diver's Mate at Telephone; Right, Fixing Bombs to Spar; Below, Bringing Up the Safe, and, at Right, Sorting the Contents of the Safe



water. The pressure of the sea had forced in the back and sides so that it presented a concave appearance. With acetylene torches the door was opened and the contents removed and taken to the "Artiglio's" cabin for examination. Most of the papers were dated April or May, 1922, corresponding to the time

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of the "Egypt's" sinking, although none of them bore the name of the vessel.

Charges of explosives were used to remove the crane and are to be employed during the rest of the work. According to engineers, explosives have not previously been used at such great depths. Because of the depth of the water and the near darkness, the task of exploring the wreck has been slow and hazardous. Divers kept in constant communication with the deck crews by means of their telephones, but there was always the risk of breaking cables or fouling lines to the immediate peril or death of the men under the water.

Alberto Bargellini, youngest of the "Artiglio's" divers, was the first to be lowered to the wreck.

"I can see three portholes," he called up by phone. "They are big ones. I think I am alongside the forecastle. Now I can see something; it looks like a crane."

Studying Model of "Egypt" to Speed Salvage; Hoisting the Crane, and "Artiglio" Pulling at Wreckage

Then followed a difficult half hour while Bargellini was endeavoring to determine what kind of crane it was. The hydraulic variety, carried by the "Egypt," is distinguished by a vertical piston, with pulleys on top. When the crane was finally blown loose and raised, the workers were certain that the hull was that of the "Egypt."

The ship's bullion room is in front of the forward funnel. Above it are the boat, hurricane, spar and main decks, all of steel and of thicknesses varying from one-fourth to three-fourths of an inch. All these decks must be cut through before the treasure room can be entered with the grappling instruments which have to be operated from above.

With modern apparatus, deep-sea diving is becoming less hazardous and more successful. Adventurers do not have to search for the wrecks of the Spanish Armada and pirate ships to find vast fortunes. Untold wealth from more recent sea tragedies awaits the successful salvager, and the finding of the "Egypt" promises to arouse new interest in treasure hunts under the seas.

Railroad Car, on Concrete Posts, Which Serves as a Rest House for Tired Mountain Climbers in the Alps

RAILROAD CAR SET ON STILTS IS ALPINE REST ROOM

For the benefit of Alpine tourists after a long climb, the Italian government has placed a novel rest house high in the mountains. It formerly was a railroad car, but has been placed on concrete posts to make it easily visible and keep it free from snow. The shelter is reached by a long, steep stair.

FIVE-YEAR OLD PLANE FLIES ACROSS THE ATLANTIC

When Captain Wolfgang von Gronau and three companions landed their Dornier-Wahl airplane in New York harbor in August after an extemporaneous transatlantic flight, they accomplished a feat that on its face would seem impossible—crossing the ocean in a ship five years old that previously had withstood the many hardships of an Arctic trip. The German plane traveled from the Isle of Sylt, in the North sea, to New York in forty-seven flying hours, making six stops on the trip of over 4,000 miles. The hardy old plane's history is associated with the feats of half a dozen intrepid flyers and explorers, part of them now dead. In 1925 the late Roald Amundsen used this ship in his attempt to reach the north pole, and for two weeks was marooned with the plane in the Arctic wilderness. On this trip Lieut. Leif Dietrichsen was a pilot. Both Amundsen and Dietrichsen perished when they attempted to fly to the rescue of the Nobile expedition a few years later. Another member of the polar expedition was Oscar Omdal, who set out from Old Orchard, Maine, in 1927 in "The Dawn" with Copenhagen as his goal, and never was heard from. Other men, still living, who were associated with this ship include Lincoln Ellsworth, Amundsen's partner; Captain Riiser-Larsen, also a pilot on the polar voyage, and who has since made many antarctic trips; Capt. Frank T. Courtney, who tried to span the Atlantic in the ship by way of the Azores, and Capt. Haakon H. Hammer, who ordered the plane for a 1924 polar flight which failed to materialize. The original motors of the plane have been replaced.

VOICE ON WHEELS HELPS DRAW CROWDS TO THEATER

Looking much like an armored car in war time as it lumbers through the streets of Berlin, a huge loud speaker mounted on a truck is used to advertise a theater in that city. The auto carries a large phonograph to which the loud speaker, cylindrical in form, is attached.

Not a Base Drum on Wheels, but a Huge Loud Speaker and Phonograph on a Truck, to Advertise a Berlin Theater

Part of the German Mouth-Organ Orchestra and Its Conductor; This Orchestra of Forty Musicians Comprises About 500 Mouth Harps, Each Member Playing Twelve or Fifteen Instruments

FIVE HUNDRED MOUTH ORGANS USED BY ORCHESTRA

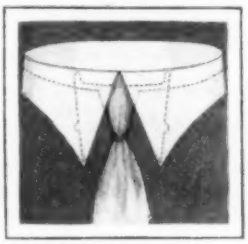
Germany boasts a mouth-organ orchestra of 500 pieces, probably the largest organization of its kind in the world. It consists of forty musicians, each of them playing from twelve to fifteen instruments. For years the orchestra has been popular in concerts, rendering both classical and popular selections on the mouth harps.

FEATHER-COVERED DIRIGIBLES PREDICTED FOR FUTURE

Ocean travelers of the future will cross the seas in giant air liners covered with feathers or scales. This is the prediction of Lieut. Col. V. C. Richmond, designer of the big British dirigible "R-100." The airship of the future, he said, might be likened to an inversion of the modern ocean liner, except that its motion will be considerably smoother. The ultimate development, he predicted, will be a dirigible many times as large as any afloat at present, with luxurious accommodations, and engine rooms spread along the bottom of the hull, both within the ship and in gondolas slung below it. Lessons learned from fast fish are being used by airship designers, and the outer covers of future dirigibles may be provided with something in the nature either of scales or feathers to reduce wind resistance. Experiments with models of feathered ships already are in progress. In addition to monster liners like floating hotels, fast, but smaller, ships will operate regular air-express service across the ocean, this expert believes.

WIRE BRACE FOR SOFT COLLAR PREVENTS WRINKLING

Soft collars are made to lie flat and are kept from wrinkling by means of an easily adjusted wire brace now on the market. It slips under the tie knot, loops over the tie and is attached to the collar points by means of small pins that do not damage the fabric and do not protrude. The brace can be adjusted in a few seconds and, no matter how the head is turned or the neck is bent, it keeps the collar smooth and returns it to its fresh and flat appearance without the use of starch. The brace is entirely hidden when in place.



Cardboard Glare Shield Which Protects the Eyes from Bright Background While Watching Planes

GLARE SHIELD FOR AIR EVENTS PROTECTS THE EYES

To protect the eyes from glare of sun and sky when watching outdoor sports, such as airplane races, or boating events, a cardboard shield, so shaped that it fits the contour of forehead, nose and eyes, is found helpful. The inside of the glare shield is black, thus affording a view of an object against a bright background without eye strain. It may be used with sun glasses, or to improve field glasses, by making a temporary extension.

AMERICAN POMPEII IN ARIZONA

Evidence of an Indian Pompeii, buried under a fall of black volcanic ash by the last eruption of Sunset crater, more than 1,200 years ago, has been found near Flagstaff, Ariz., by a museum expedition. The eruption has been tentatively dated between 500 and 700 A.D. Searching within five miles of the crater, the expedition uncovered prehistoric sites representing three stages of Indian life, including late basket-maker Indians and the first and second stages of Pueblo culture which followed. Over the sites inhabited by the two older groups is the sinister black blanket, but none of the pit houses of the later age showed any ash traces. Much charcoal has been recovered, and the sites may be dated accurately by the tree-ring method of computation.

BERYLLIUM TO SOLVE PLANE CORROSION PROBLEMS

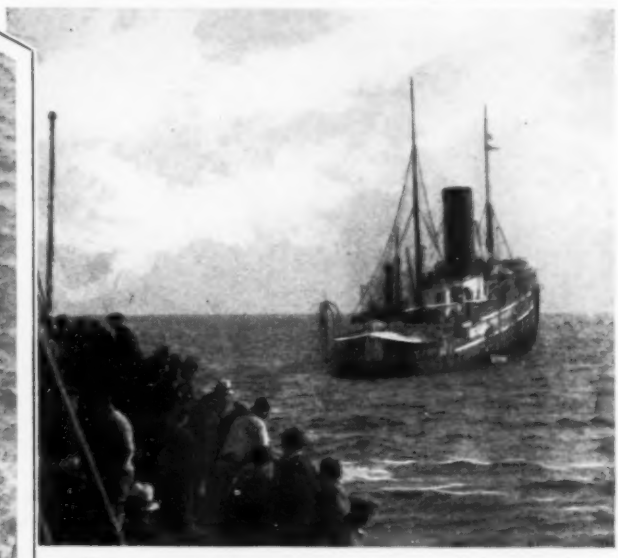
Corrosion, one of the greatest enemies of light alloys used in the construction of all-metal aircraft, may be conquered in the near future, due to the discovery of a cheap process of producing beryllium. Beryllium is not a rare metal, but the difficulty of extracting it has made it very costly, so that it has been produced in the past only on a laboratory scale, at a price of about $200 a pound. It is the lightest metal known that is not corroded in air, and light alloys high in beryllium would have the strength of steel with the lightness of aluminum. Alloys at present used in the construction of all-metal aircraft must be protected from the air by anti-corrosion coatings, none of which have proved entirely satisfactory, and it is expected that the use of beryllium will solve this problem, replacing the alloys of aluminum which are now used for this purpose in the majority of planes.

DOLL'S HEAD IS ILLUMINATED BY TAPPING WITH FINGER

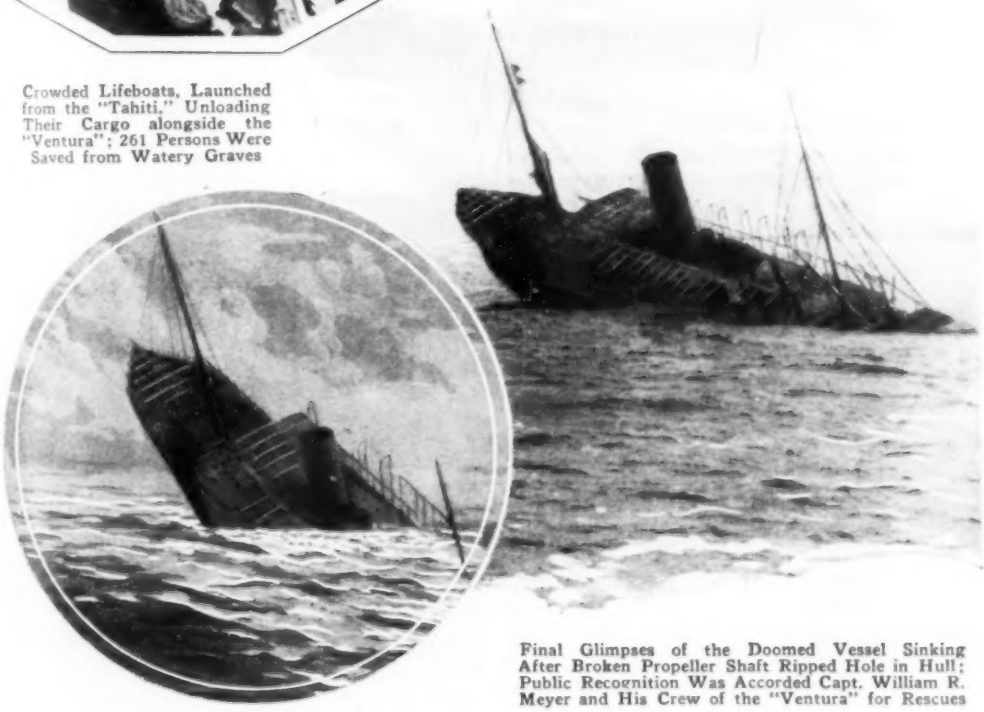
Made of celluloid, a doll's head which is illuminated by tapping with the finger is proving popular with children and adults who employ it as a night lamp. The head contains a small electric-light bulb, and is set on a spring which is connected with one terminal or a battery inclosed in the doll stand. By touching the head with the finger, it is depressed so connection is made with the other terminal, thus lighting the bulb.

THE LAST MOMENTS OF A SINKING PACIFIC LINER

Crowded Lifeboats, Launched from the "Tahiti," Unloading Their Cargo alongside the "Ventura"; 261 Persons Were Saved from Watery Graves



Views of the "Tahiti" Just as She Started to Sink; in the Foreground, Refugees on the "Ventura" Which Took Many Passengers from the Ill-Fated Vessel; Radio Is Chiefly Credited with Making This Rescue Possible



Final Glimpses of the Doomed Vessel Sinking After Broken Propeller Shaft Ripped Hole in Hull; Public Recognition Was Accorded Capt. William R. Meyer and His Crew of the "Ventura" for Rescues

Flexible Milepost, Made of Rubber, Used in Germany to Prevent Automobile Accidents

FLEXIBLE SIGNPOSTS PREVENT AUTOMOBILE ACCIDENTS

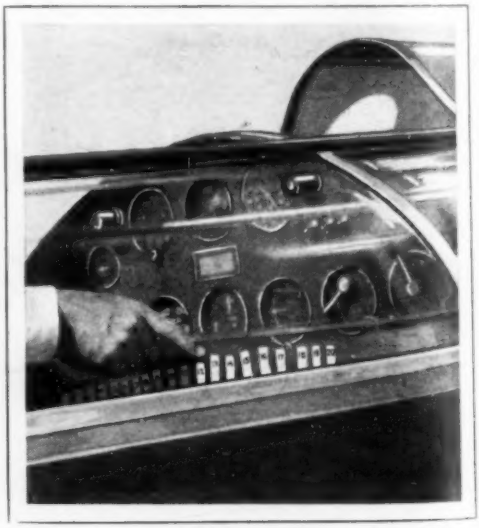
Rubber mileposts and sign standards are being installed along some sections of German highways to make travel safer for motorists, particularly where roads are narrow. These flexible posts, painted in bright colors, bend to a horizontal position if a car strikes them, but spring back into shape without damage when the machine has passed over them.

VACUUM TUBE MEASURES HEAT RADIATED BY STARS

Infinitesimal flows of current, as little as one hundredth of a millionth of a billionth of an ampere can be measured by a type of vacuum tube recently developed by the General Electric company. The electron flow through the tube compares with that through the usual fifty-watt lamp as do two drops of water with the volume spilled over Niagara Falls in a year. The four-element tube is able to measure accurately a flow of about sixty-three electrons a second while three quintillion electrons, represented by a three followed by eighteen ciphers, flow through the fifty-watt lamp bulb each second. The tube is so sensitive to small flows of current that astronomers can use it with photo-electric tubes to determine the amount of heat radiated by stars countless miles away, for the current is measured in distances in multiples of quadrillions of miles. The tube may replace electrometers to a great extent because it has the advantage of greater sensitivity and much greater ease in mounting, since it does not have to be rigidly fixed like an electrometer.

TAPES HELP AIRPLANE RACER KEEP TRACK OF LAPS

Roaring around the pylons at a speed of nearly 200 miles an hour, "Jimmy" Haizlip, pilot of the Shell Oil company plane that won second place in the Thompson trophy race at the recent air meet in Chicago, kept track of the laps by means of small strips of adhesive tape, pasted on the instrument-board panel. The strips were numbered from one to twenty and, at the completion of each lap, Haizlip simply tore off one of the tabs and threw it away. The plan proved a good one to prevent losing count of the laps, something that is likely to happen where so many rounds must be made on a course as short as five miles.



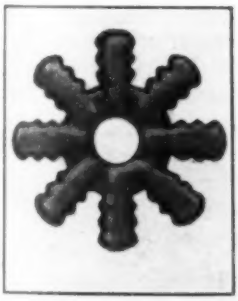
Strips of Tape to Help Airplane Racer Keep Tab on His Laps; One Is Discarded Each Round

RAYS TELL IF GEM IS FALSE OR GENUINE

Cathode rays are being used successfully in detecting artificial precious stones from the genuine gems, particularly in the case of sapphires. Each year millions of sapphires are used as jewels in electrical instruments, and the natural gem is much superior to the synthetic. Trays of unclassified sapphires exposed to the rays for a few seconds in a dark room are found to glow or radiate colors, with the exception of one kind of natural gem. When the rays are turned off, the natural stones cannot be seen, while the synthetic ones continue to glow, thus making separation easy.

Scenic Painting on Rear of an English Bus Which Not Only Supplies a Novel Decorative Effect, but Advertises the Coach's Route

PROTECTORS FOR GAS BURNERS PREVENT ACCIDENTS



Metal shields which fit over the gas burners protect them from boiling liquids which might otherwise extinguish the flame, and keep the burners clean at all times. Burner holes are kept free from clogging by the protectors which also prove highly efficient in cooking.

LIGHTHOUSES ARE ILLUMINATED TO SAVE LIVES OF BIRDS

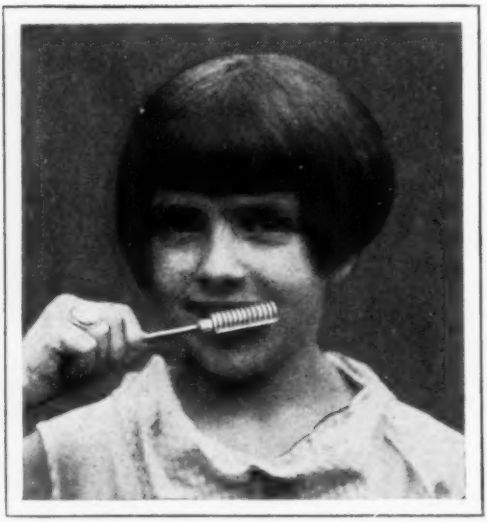
German and Dutch lighthouses have been illuminated to save migratory birds. Rings of lights have been installed around the outside of the towers, illuminating ramparts, railings and cupolas, thus giving the birds some landmarks other than the blazing eyes of the lighthouses when they seek perches on which to rest.

SCENIC PAINTING ON AUTO BUS ADVERTISES ITS ROUTE

English omnibuses are being decorated with scenic paintings, most of them depicting points of interest along the route traveled by the coaches. Scenic artists are employed to paint the bits of nature on the rear panels, the views ranging from old castles to pastoral scenes.

HAND DRILL MAKES POLISHER FOR TYPEWRITER KEYS

Typists who have trouble in keeping the keys of typewriters and adding machines clean because water and alcohol usually discolor the transparent celluloid, now can perform this task in a few seconds with an automatic cleaner which in reality is a small hand drill fitted with a felt pad instead of a bit. When the drill is placed on the keys and turned rapidly, the felt cleans and polishes in one operation. The tool requires only extra pads to make it last for an indefinite time.



Toothbrush without Hair or Bristles; It Is Made of a Rubber Composition, in Disk Shape

RUBBER DISKS IN TOOTHBRUSH REPLACE BRISTLES

Disks made from a rubber compound replace hair or bristles in a toothbrush which, it is claimed, is more sanitary than the ordinary type. The disks of rubber, extending around the brush, are thin enough to enter between the teeth, and the rubber itself produces a polish when used with a dentifrice. The brush is easy to keep clean, and there are no parts to pull out and lodge in the gums or get between the teeth.

AIR HARBORS BENEATH GROUND TO PROTECT WAR PLANES

British air-ministry officials are considering the establishment of underground air harbors to protect air fleets from the counter-bombing of enemy planes in time of war. Unable to beat off attacking bombers during recent maneuvers, defending air forces resorted to theoretical bombings of the enemy airdromes, demonstrating an ability thus to destroy many times as many planes as would have been possible in straight combat in the air. The comparative ease of bombing machines in hangars, or on the ground, led to the suggestion that subterranean hangars would be necessary in the next war. The planes would be housed underground and brought to the surface in elevators heavily protected by concrete shelters.

CANNON MADE OF SILK THREAD STRONGER THAN STEEL

Making use of the little-known fact that silk possesses a tenacity greater than that of the best-tempered steel for any given diameter, a German inventor has worked out a method for making a silk cannon by wrapping a steel tube with silk until a suitable diameter is obtained for the cannon. The tube is wrapped with silk thread in the form of a close helix, and when the desired thickness is reached, it is covered with gutta-percha to protect it from moisture. Silk has more elasticity than steel, and, being a poor conductor of heat, permits a gun being fired many times before it becomes hot.

ELECTRIC HAMMER FOR FENDER IRONS OUT DENTS

For removing dents in fenders and ironing out creases in other sheet-metal parts of automobile bodies, an electric hammer now is being used. It employs a crank lift for the hammer, and a drop or spring actuation for the working stroke. An anvil, used in connection, is adjustable to vary the length and power of the stroke, a half turn of the handle covering the entire stroke range. This adjustment can be made while the hammer is in operation. It delivers about 1,000 blows per minute, and various sizes and shapes of both hammers and anvils are available and can be used to advantage.

Electric Hammer and Anvil Employed in Ironing Out the Dents in Auto Fenders and Bodies

One of the **Latest Model Windmill Planes Demonstrated at the National Air Races; Some of Them Now Have a Clutch Permitting the Engine to Whirl the Vanes at the Take-Off**

CLUTCH FOR WINDMILL PLANE SPEEDS UP TAKE-OFF

Recent models of the autogyro, or windmill plane, exhibit a number of improvements over the earlier types. Chief among them is a clutch which permits power from the motor to be used in rotating the overhead vanes, in this way speeding up the take-off and reducing resistance. Once the vanes are in motion, the clutch is disengaged. The windmill plane is able to fly largely because its motion through the air causes the four-bladed paddlewheel to rotate. One autogyro has rotor, wings and tail surfaces covered with bakelite, thus producing a smoother surface, and providing greater strength. It has a four-bladed paddlewheel, each vane being seventeen feet long. Stub wings carrying lateral-control surfaces contribute to the lift at high speeds. The two-seated fuselage has dual controls, and the motor is 110 horsepower.

SUBSTITUTE FOR CHEWING GUM PRODUCED FROM BENZINE

Synthetic chewing gum, made by adding a little chlorine to a substance produced from benzine, is a recent product of the chemical laboratory. This is a substitute for chicle, and is tasteless and odorless. The gum may have medicinal properties, early experiments have indicated. It is an incidental discovery in a score of commercial possibilities, all coming from utilization of a new chemical, diphenyl.

ELECTRIC FLYTRAP DESTROYS INSECTS ON CONTACT

Flies and other household insects now are put to death in an "electric chair," a flytrap which utilizes an electric current to destroy them. It consists of a metal box with a removable tray at the bottom and alternative, positive and negative wires strung diagonally over the opening at the top. When plugged into an alternating light circuit, the trap utilizes a special transformer to feed current to the wires. This flow of current is harmless to human beings but deadly to flies coming in contact with the wires. It is baited like any ordinary trap.

The MYSTERY

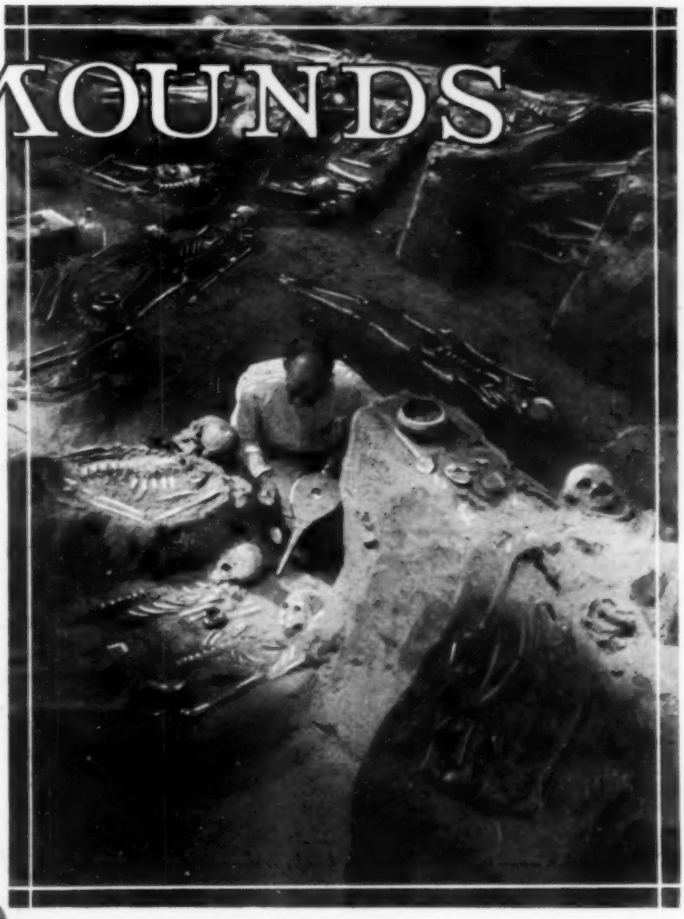
Dr. Henri Denninger Restoring Some of the Skulls Recently Found in Illinois Indian Mounds by Archæologists from the University of Chicago

WHO were the mound builders? How long ago did they live? Whence did they come and where did they go? They built mounds larger than the pyramids of Egypt. They were expert carvers and makers of pottery. They strung beautiful necklaces of pearls. Theirs was the highest civilization in North America before the coming of the white man, but, apparently, they have vanished, leaving not a single written word of their doings.

To solve this mystery of the ages, an expedition headed by Dr. Fay-Cooper Cole, of the University of Chicago, has been delving into the mounds on the estate of Joy Morton, near the junction of the Illinois and Spoon rivers, not far from Lewistown, Ill. More than 100 skeletons have been removed and large quantities of pottery, beads, arrow heads, pipes and other objects, and important facts concerning the mound builders have been discovered together with clues to a new mystery. Below the level of the earliest mounds, skeletons of another group of people, who must have preceded the others by many years, were found. The skulls were longer and lower. Did they belong to an entirely different people or did the skulls of the later arrivals change in shape?

In contrast to ruthless trophy seekers, who, unfortunately, have been allowed to destroy thousands of mounds in Illinois and neighboring states, Doctor Cole and his associates work with the skill and patience of experts on a murder case. After a mound is located, its outlines are sketched and it is staked off in five-foot squares. It is then literally sliced away like a loaf of bread while constant watch is kept of the kinds of soil uncovered, the location of all objects discovered, and other data, so that accurate charts and drawings can be made. The soil is examined with microscopes and subjected to chemical analyses. The excavators use such delicate tools as orange-wood sticks, tiny trowels and small brooms. Every bit is sifted for trace of a clue that may reveal

of the MOUNDS

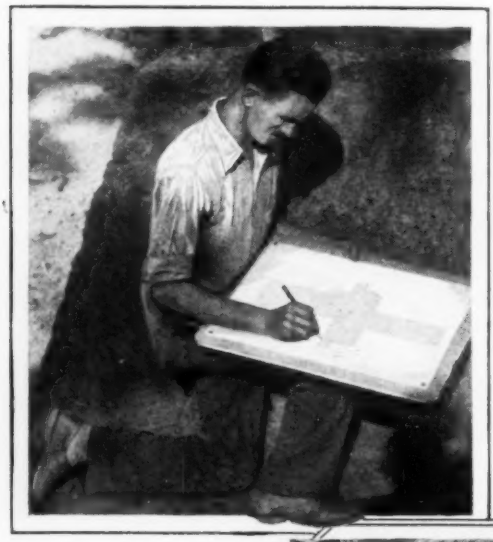


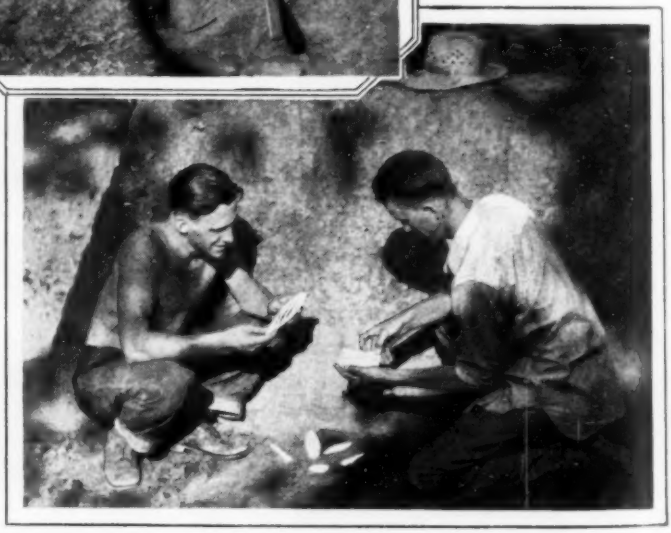
a fact as to the age of the mound and the characteristics of its builders.

As a result of this work, scientists now feel certain that the mound builder and his fellow Indians originally came from Asia, entering the North American continent by way of Bering straits. The journey is not at all impossible. In recent times, a mother and her child made the trip alone, paid a visit in Siberia and returned safely home to Alaska. The Indian is, therefore, of Mongolian origin. One group wandered down the Pacific coast, another into the region of the Great Lakes and eastward. Still others went far to the south, into what is now Mexico and Central America and into South America. Mayas and their wonderful civilization, Aztecs, Incas, the mound builder and all, are Indian, it is believed.

Dr. Don Dickson Blowing Dust from Skeleton; Below, Ocher War Paint in Mound Is Still Brilliant

When the visitors arrived at what is now the region around Mexico City, they achieved a real civilization. They learned how to make pottery and, by cultivating a kind of wild grass, they developed corn. The arts of these more advanced people spread toward the north and south through trade, intermarriage and invasion, until, finally, many of their inventions reached the Mississippi, Illinois and Ohio valleys. In the region where Doctor Cole and his party were digging last summer, a sort of crossroads or melting pot of Indian groups was established. There are more than 1,500 mounds in Fulton





Mapping Mound Site Removing Skeleton with Aid of Special Tools and Examining Stone and Copper Relics

county alone. Many more thousands have been located in the surrounding territory.

"Science has found evidence of at least nine main Indian cultures in North America," says Doctor Cole. "The immigration from Asia started some 12,000 years ago and, bit by bit, we are piecing together the record of the newcomer's ventures in the new land, how he fitted himself into the new surroundings and how he, himself, was changed by his new world. This same story is being re-enacted today, although under greatly different conditions; therefore we consider the history of the mound builder as an important chapter in the main theme of man's life story.

"Near Lewistown, we find at least three cultures of Indians. In the river valleys, we have uncovered mounds of the so-called Hopewell culture, named after the owner of the farm in Ohio where this type of Indian was first identified some thirty years ago. Evidences of the Hopewell Indian are discovered in Indiana, Minnesota and Wisconsin. We are not certain just where he originated but he probably lived in Illinois at least 2,000 years ago. These Hopewell mounds are the oldest of the three types we have been investigating this past summer. They are easily identified by the definite type of construction, the few skeletons found in them, probably those of chiefs or medicine men or their wives, the absence of pottery and the remains of altars that may have been used either for sacrificial or for crematory purposes.

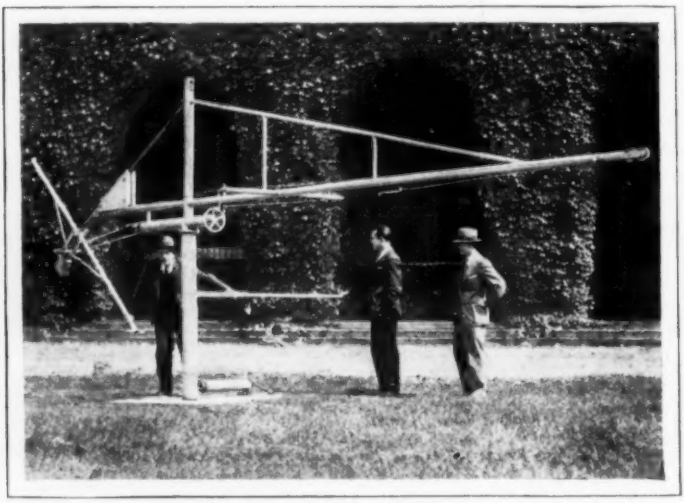
"Higher up in what were probably river terraces, we find mounds of a different character altogether. They contain larger numbers of skeletons and the bodies were buried in a flexed position, with the limbs folded up on the chest. Pottery of a distinc-

tive kind is found in these mounds. On the same river bluffs, is a third culture, probably the most recent of all the prehistoric groups. In these mounds, the bodies are buried fully extended instead of flexed and large quantities of pottery of a distinctly different pattern from that discovered in the river terrace mounds are found, together with other relics. For some time, there was doubt as to which of these two cultures was the older, the bluff or the terrace culture, but this summer, we found a mound in which the bluff culture had been buried above the other, indicating that this was the more recent.

"The Ohio mounds yield obsidian arrow heads but obsidian is found no nearer than the Yellowstone. Copper beads and other objects of copper are also found, but there is no native copper in Illinois except fragments deposited by the glaciers. Some of the beads are of the shells that, today, can be found only along the Gulf of Mexico. These discoveries indicate that these Indians must have had commercial and social contacts with other groups. It is by these bits of transplanted evidence that we are able to trace the comings and goings of the various cultures. For some time, it was believed that the Hopewell Indian knew how to weave a kind of cloth. Not a shred of fabric had been found in the mounds, but proof of their knowledge of weaving was finally furnished by fragments preserved beneath a bit of copper that was carefully unearthed. The flat surface of the metal also showed marks of the woven cloth."

Dr. Thorne Deuel Excavating, Bead-Covered Skeleton in Famous "Pyramid" Mound and Uncovering Burial

As the romantic story of the mound builder is being pieced together, a new picture of Indian civilization is created. He was a lover of beauty. His carvings rival the achievements of modern artisans. Although the Indian did not have the potter's wheel, some of the hand-fashioned pots and bowls are so symmetrical that the unaided eye cannot detect the slightest defect. It is also interesting to learn that study of some of the skeletons reveals that the mound builder was afflicted with tuberculosis and other ailments known today.



Football Tackling Machine Used to Train Harvard's Squad; It Causes a Dummy to Run, Dodge and Execute Other Mystifying Maneuvers

FOOTBALL TACKLING MACHINE IMITATES REAL PLAYER

Harvard's football squads this year were trained by a football robot, or tackling machine, that is able to imitate most of the movements of a real player dashing down the field with the ball. It consists of an upright pole supporting a crossarm to which are attached springs and counter-checks causing the dummy to run, dodge and enact other elusive maneuvers.

GIANT GAS BURNER HEATS KILN IN SUGAR REFINERY

One of the largest gas burners in the world is employed in a sugar refinery at Johnstown, Colo., in maintaining a calcining tube kiln at a temperature of 2,750 degrees Fahrenheit. The burner is fourteen feet long, has a nozzle opening fifteen inches in diameter, and consumes 50,000 cubic feet of natural gas an hour. Use of the burner and natural gas as fuel resulted in a savings of forty per cent as compared with the cost of coal.

Installing a Huge Gas Burner in a Sugar Refinery; It Consumes 50,000 Cubic Feet an Hour

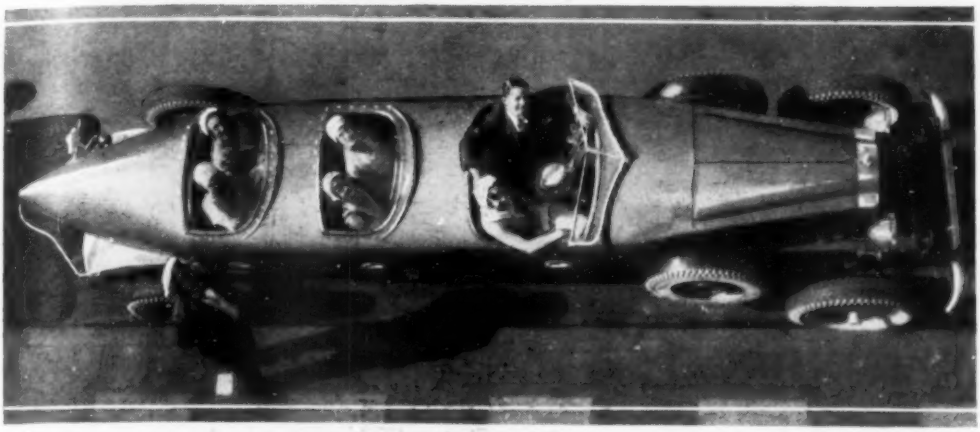
MIRRORS MADE OF POLISHED WOOD

By means of an elaborate process of treatment, a German has made a wood that will take a polish sufficiently brilliant to be used as a mirror. The metallization of wood has been practiced for some time in that country, the resulting product being found to answer for some purposes as well as metal. The wood is first soaked in caustic alkali at high temperature and then goes through a process of immersion in metals and chemicals, after which it is dried and rubbed smooth. When rubbed with a smooth piece of lead, tin or zinc, the wood takes an exceedingly brilliant polish and can readily be used as a mirror. It is impervious to moisture.

RUBBER CRYSTALS TO REVEAL CHEMICAL COMPOSITION

Crystals of rubber have been produced in the chemical laboratories of the federal bureau of standards and are expected to aid in finding the chemical composition of this material. In achieving this result, it was necessary to make the purest rubber ever produced, a block as transparent and colorless as window glass. Dissolved in ether and cooled at eighty degrees below zero Centigrade, minute rubber crystals were formed. Once a small quantity of crystals is isolated, chemical composition can be determined by burning and analysis. This should give the true rubber formula which many chemists believe to be a molecular composition of some multiple of five carbon atoms and eight hydrogen atoms.

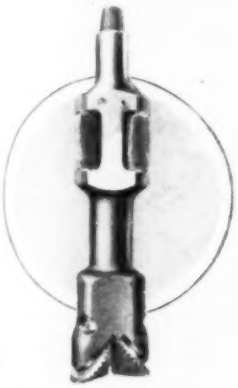
TWENTY-FIVE FOOT AUTO SEATS SIX PASSENGERS



Three-Seated Automobile, Twenty-Five Feet Long, of Streamline Design; Parking Becomes a Real Problem for the Driver of This Car, Which Was Built by a California Man

Parking becomes a real problem for a Hollywood man who has built an automobile twenty-five feet long. The car is of streamline design with long, tapering body and three seats. Since it requires a good share of a city block to pull over to the curb, the owner usually contents himself by having it driven around the block while he transacts his business.

OIL-WELL BIT ASSURES SPEED IN DRILLING



Giving greater assurance of a straight hole, an oil-well bit which goes through rock or soft formations alike now is available. In the past, two rock bits have been needed, so that when a dull one is pulled, a new bit could be substituted without waiting to change cutters, thus necessitating an investment in two complete shanks. With the full service bit, when a dull set of cones is pulled, it is only necessary to remove the head containing the dull cones and screw in a fresh one. An oil lubricator is eliminated by using slush lubrication. Above the drill bit is a three-point reamer with extremely large cutters, insuring a round and full-gauge hole, a maximum of clearance permitting free circulation of mud.

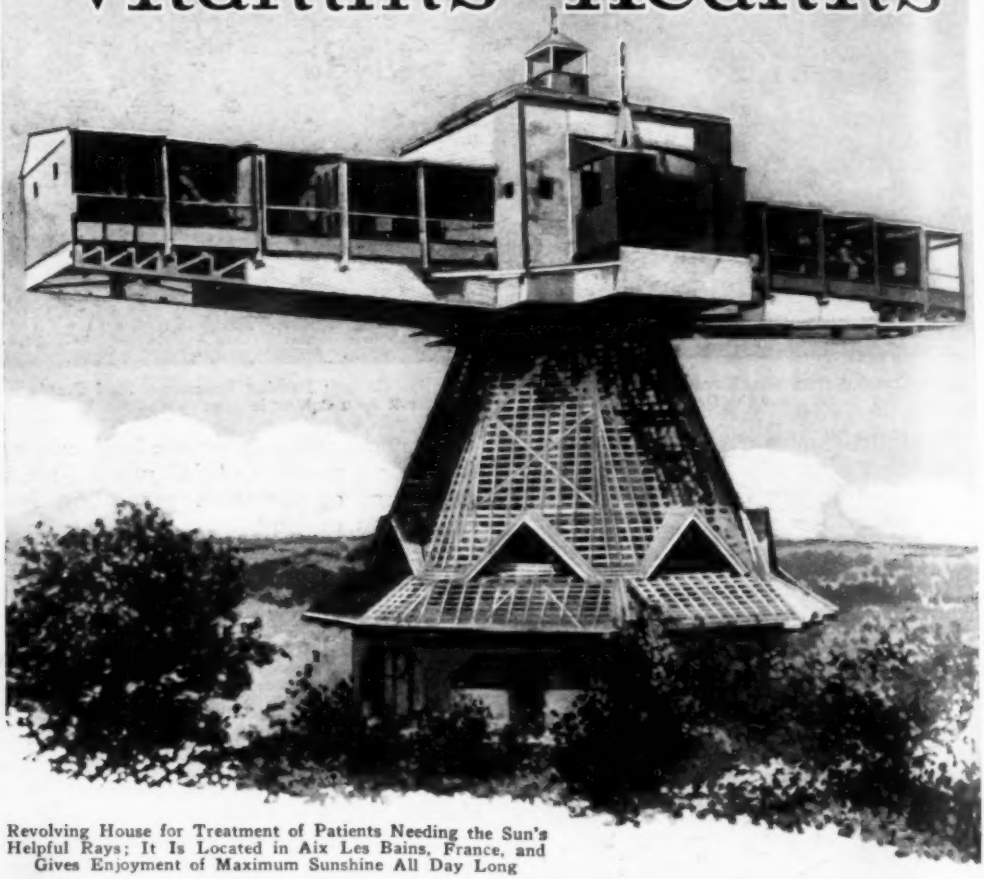
OIL MADE FROM CHERRY PITS GOOD FOR SALAD DRESSING

Oil extracted from cherry pits has been found good for use in salad dressings and for the manufacture of cosmetics and various drugs, the department of agriculture has announced. In some respects the oil is similar to that prepared from almond, peach and apricot pits, according to chemists, and should prove commercially profitable if it can be made in sufficiently large quantities.

HOLDER FOR CLEANSER CANS IS RUSTPROOF

Made of aluminum in a variety of colors, a holder for household cleanser cans now is available. Its use safeguards tiling or porcelain from rust stains, and it is provided with a handle and fits nearly all standard-size cans for this product.

Vitamins–Health's



Revolving House for Treatment of Patients Needing the Sun's Helpful Rays; It Is Located in Aix Les Bains, France, and Gives Enjoyment of Maximum Sunshine All Day Long

NEARLY thirty years ago, a Dutch physician on the island of Java, in the East Indies, fed his chickens on polished rice, that is, rice from which the natural husk had been removed. Outside, where the fowls could get bugs, worms and green leaves, they did well enough, but cooped up and fed exclusively on the polished grain, they languished and died.

Thus he established beyond a doubt, that, although the rice husks contained nothing of food value, they did hold some factor without which the fowls could not live.

As a result of the simple experiments of this obscure Dutch physician, Eijkmann, the medical world is now forming an entirely new conception of the causes and development of disease. Ailments which were thought to come from outside infection have been proved to result from inward deficiencies fairly easy of correction.

Development of the discovery has overthrown the old ideas of diet efficiency and given physicians and dentists a new weapon with which to attack disease. It has given weak, ailing children a chance to become strong and vigorous. Suffering adults have found in it new life and hope. It has resulted in cures that border on the miraculous. In short, the ailment of the Java physician's chickens was the motivating influence that led to the discovery of the accessory food factors—vitamins.

Two other physicians of the East Indies, Frazer and Stanton, used a group of Javanese laborers to prove that the same

Mysterious Allies

principles that made the fowls lose health applied to human beings. Then another investigator, Funk, prepared a highly potent factor from the extracts of rice husks. In experiments upon animals, he proved that they could not live without this factor. As it was vital to life, he called it vitamine, a term now shortened to vitamin.

The name choice was a good one, for now the medical world knows that without vitamins there would be no life. Even a small deficiency of one or more of the recognized vitamins results in disease. Fortunately, vitamins are widely distributed in the things we use for food, and physicians have learned to recognize conditions that result from vitamin deficiency. But there is still much of mystery in vitamins. No one has yet succeeded in isolating a single one of them. Nobody has seen, smelled, tasted or felt a vitamin, nor has anyone been able to determine exactly what they are. Lack of exact knowledge, however, has not prevented the medical world from using vitamins to effect cures. Consider a group of underdeveloped children taken into the hospital of the medical school of a great university.

Children Freed from Scurvy and Rickets Largely through the Action of Sunshine on Their Bodies

The children were weak of bone and body, they were undernourished, and their jaws were covered with diseased gums and filled with decayed teeth. They were placed on a diet rich in vitamins C and D, and in calcium, or lime, the bone-building element in food, for one of the main functions of vitamins seems to be in assisting

the animal body to utilize the upbuilding elements in food. Hence, without lime, the most energetic vitamin could not build bone. In addition, the children were exposed to the direct rays of the sun for certain periods each day.

After the first ten days on the vitamin-rich diet, not a single new cavity developed in the children's teeth. Not only that, but shortly afterward the progress of the decay stopped in the established cavities, and before the experiment was at an end, a great many of these cavities had filled up and healed over with new dentin. That was the work of vitamin C in the main, assisted by vitamin D.

In the meantime, vitamin D had assumed the greater part of the work of rebuilding the body bones. Rickets is a disease widely prevalent among undernourished children. The ailment prevents the development and hardening of the ends of the long bones. Vitamin D's main function seems to be the making of strong ends for such bones. Sent into the life stream, this vitamin will actually take lime from the center of the bone, if it cannot find a supply anywhere else, carry it to the end of the bone and deposit it there.

Modern dentists are seizing upon the aid of vitamins to assist them in their corrective and preventive work. There is a boy in an eastern city who, a year ago, was subject to frequent violent colds. His development was below normal and his teeth were diseased. The dentist recognized a vitamin deficiency as the cause of the youth's troubles and advised the parents to add a pint of orange juice and a quart of pure raw milk per day and more green vegetables to his diet. In a single month, the improvement in his health was so marked, and in six months he was so well and strong that he already was approaching the ruggedness that he later attained.

Monkey Exposed to Ultraviolet Rays; Skull, on Left, from Monkey Fed Normal Diet; On Right, Deficient in Vitamin C

The actual curing of dental cavities by diet seems incredible to us, who have always believed that decay comes from the outside of the teeth. However, the experiments carried on by Dr. Percy R. Howe, at the Forsyth Dental Infirmary, in Boston, Mass., where every year the tooth ailments of more than 35,000 children are treated, shows that in the main tooth decay is a deficiency disease and comes from the inside.

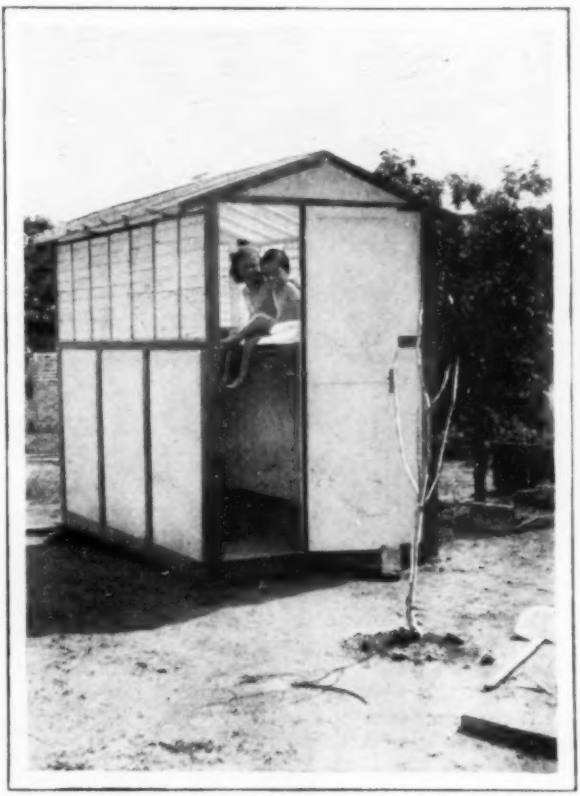
By placing the section of a tooth beneath a strong microscope, the doctor

shows that the dentin and enamel of teeth are living structures fed through canals leading from a multitude of little cells surrounding the tooth pulp and pressed close against the dentin. Certain elements of the diet are brought into the tooth by blood vessels in the pulp and delivered to the cells—called odontoblasts or dentin formers—and in turn are carried on to the living structure by capillary attraction in the canals.

The doctor's experiments in this regard have been upon guinea pigs and monkeys. He has been utterly unable to induce decay by feeding the animals the supposedly infectious material extracted from tooth cavities as long as they are kept on a vitamin-rich diet. But change the diet to one free of or deficient in vitamin C, and it isn't necessary to feed the carious matter to attain decay. Deprived of C, the teeth soon degenerate and develop cavities.

An entire absence of this vitamin soon kills the animal. Fed just enough to keep it alive, death is long drawn out, and, when it occurs, not only are the teeth gone, but there is hardly a whole bone in the body. Sections of teeth extracted at intervals during the experiment show how degeneration proceeds from the interior of the tooth.

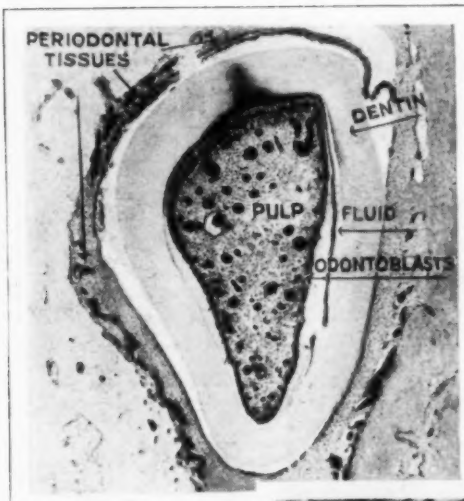
At the end of seven days on the C-deficient diet, the pulp has started to contract. In fourteen days, it has shrunk to such a degree that the cells have been withdrawn from contact with the dentin and can no longer feed the structure. With the process allowed to continue a short time longer, the tooth goes to pieces. But if vitamin C, in the form of a small quantity of orange juice per day, is added to the diet, at the end of the two-weeks pe-



Sun-Treatment House; Translucent Sea-Shell Material That Passes the Healthful Rays is Used Instead of Glass

INTRODUCING THE VITAMIN FAMILY

Designation	Diseases Prevented or Cured	Principal Sources
A	Ophthalmia (eye inflammation), gland abscesses, urolithiasis, pulmonary infections	Cod-liver oil, butter fat, milk, oranges, fresh fruits, vegetables, egg yolk
B	Polyneuritis, beriberi	Unpolished rice, yeast, grain embryo, fresh fruits, fresh vegetables
C	Scurvy, tooth decay, pyorrhea	Orange and lemon juice, milk, fresh fruits and berries, vegetables
D	Rickets, tooth decay	Cod-liver oil, milk, egg yolk, yeast, butter fat, green vegetable leaves, wheat kernel, fresh peas, fish roe, liver, kidney, brains, heart, coconut
E	Sterility	Wheat germ, lettuce
F	Pellagra like lesions	Yeast, green vegetable leaves
G	Pellagra	Yeast, green vegetable leaves, bananas



riod, the pulp expands, though never to its original size, the cells build up secondary layers of dentin, and the teeth are saved from destruction.

The benefit of the ultraviolet rays of the sun, or of those artificially produced, in the cure of rickets and other bone troubles has long been accepted. But it is only recently that the researchers have established the reason for the potency of these rays. And in doing so, they have come closer to the secret of the vitamins.

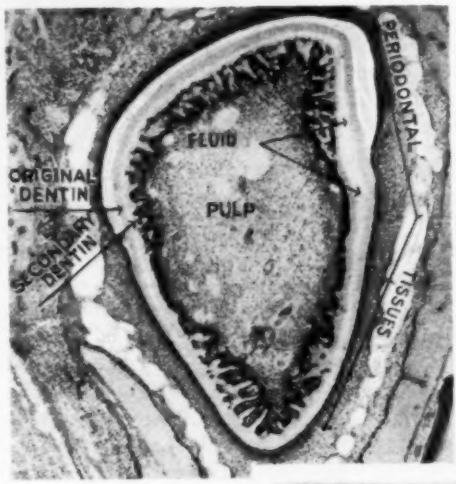
There is in cod-liver oil, yeast, certain animal and plant tissues, and in the skin, a substance known as ergosterol. As it occurs, it seems to have no special potency, either beneficial or harmful, but subjected to ultraviolet rays, this substance develops a vitamin-D efficiency 200,000 times that of cod-liver oil, hitherto considered the richest source of the vitamin.

The medical laboratories now extract ergosterol from yeast, subject it to violet rays and offer it, diluted in edible oils, to physicians as the first concentrated essence of a vitamin yet produced. Investigators do not believe that it is too much to hope that, in time, they will also produce like concentrations of the other vitamins.

It has been stated that ergosterol also occurs in the skin of the body. Hence the benefit of exposing the bare skin to the sun's direct rays. The violet rays change the ergosterol into a vehicle active in vitamin D, and it is taken up by the blood stream and distributed throughout the body to carry on its good work in bone building.

The quantity of any vitamin necessary to preserve health is not large; in fact, it is almost infinitesimal. One-tenth of an ounce of tomato juice daily, fed to a guinea pig on a diet otherwise constituted to induce scurvy, will prevent the disease and keep the animal healthy.

Withhold from a colony of experimental white rats their needful ration of vitamin A, and the result is horrible. They suffer the worst tissue damage possible. Their eyes get sore with a disease that no disinfectant will



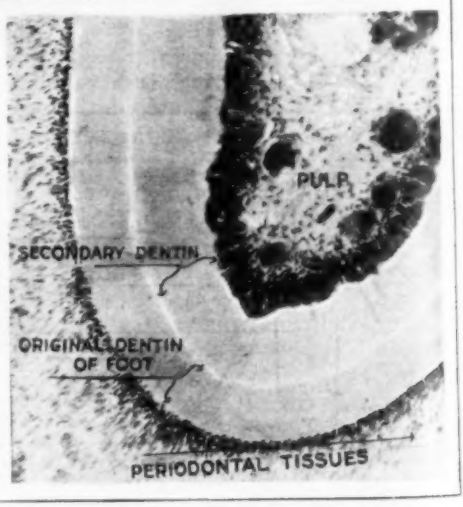


Photo-Micrographs of Guinea Pig's Tooth Showing Changes Produced by Feeding Orange Juice

aid. The lids become reddened and the light hurts the eyes. Ulcers develop on the cornea, and soon blindness follows. But add to the diet of those same rats one-three-hundredths ounce of butter fat or one-thirty-thousandths of an ounce of cod-liver oil daily, and the disease is checked and cured.

So to the old accepted and supposedly perfectly balanced diet of fats, carbohydrates, protein, salts and water, the medical world has added one more item—vitamins. And they are inclined to lay more stress upon the last than upon any of the others.

AIRPLANE TIRE TESTER SHOWS SAFE LANDING EQUIPMENT

To determine what happens to airplane tires when landing, a rubber company has made a machine that delivers, to inflated tires, blows comparable in speed and force to those sustained by a landing ship. The tire tester is expected to develop accurate information concerning the strength of tires under heavy loads, hard landings and irregular runways, thus making possible the production of safer landing equipment. The testing apparatus consists of a vertical guide track, 100 feet high, down which a known weight is dropped on a mounted and inflated tire. The exact speed of the weight in dropping is recorded on a rotating cylinder operated by a synchronous motor, the slope of a line made on the graph by an indicator attached to the weight carriage being used to calculate speed. The weight has a maximum speed of fifty miles an hour in dropping, and various types are used to approximate the many obstacles encountered in actual landings. Flat plates are used to test landing on hard-surfaced runways.

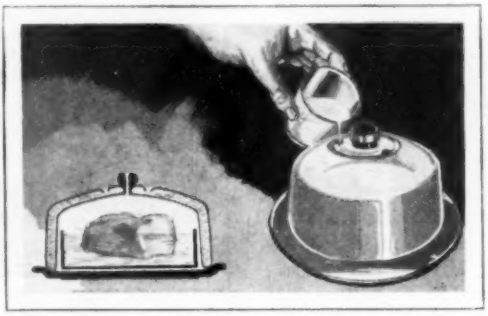
Cycle Car or Land Skiff Which Is Proving Popular in England; It Is Operated by Hand Like a Velocipede

CYCLE CAR OPERATED BY HAND CARRIES ONE PASSENGER

Operated by hand much like a boy's velocipede, a cycle or land skiff has made its appearance in England. The vehicle, mounted on four wheels, carries one passenger who manipulates a lever in front of the seat to provide the motive power.

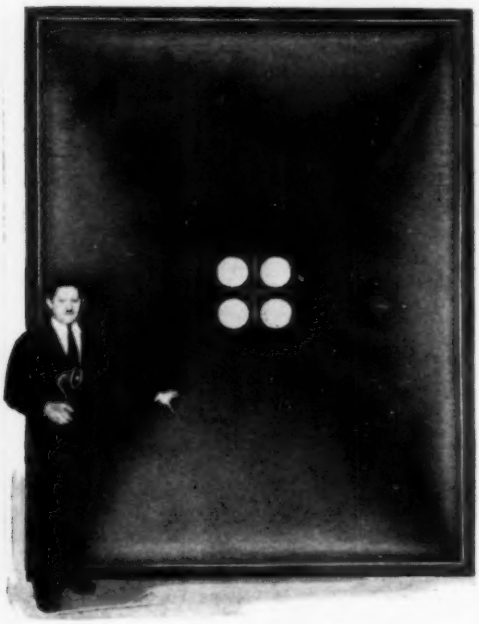
BUTTER COOLER WITHOUT ICE ACTS BY EVAPORATION

Butter may be kept cool and fresh without ice by using a special container which applies the principle of cooling by evaporation. The cover of the container includes a layer of porous clay and is filled with water which trickles through the clay and evaporates, thus cooling the contents of the jar. There is also an extra reservoir for water.



Butter Cooler with Porous Clay Lining through Which Water Passes to Cool by Evaporation

HUGE LOUD SPEAKER PROJECTS SOUND WITH CLARITY



Giant Loud Speaker Which Responds to Very Low Notes and Projects Sound with Great Clarity

One of the largest loud speakers of its kind in the world is a giant baffle horn, twice as tall as an average person, made by a New York manufacturer to project sound with great distinctness. It responds to music notes as low as twenty-six cycles and projects the sound evenly and clearly to every part of an auditorium. Its depth and fidelity of tone are much more pronounced than with smaller horns.

DELAY OF OLD AGE IS SEEN IN CONTROL OF LIQUIDS

Retention of fluids in the human body can be controlled almost at will, being increased or decreased by careful management based upon a biochemical blood analysis. Dr. Irving S. Cutter, of Northwestern University medical school, views this fact as of great importance in prolonging the lives of persons suffering from oedema. Oedema is described as an accumulation of excess fluid in the body tissue, caused by factors closely paralleling those influencing the rapid onslaught of old age. Scientists have reason to believe that, if successful in the treatment of oedema, they may control or delay the advance of old age, Doctor Cutter said, since they appear to be influenced by the same factors.

STREAMS RIDDED OF GARFISH BY ELECTROCUTING THEM

Garfish, which prey on the game varieties, are being cleared from Texas streams by electrocuting them. These fish were found to have a peculiar anatomy, making them easy victims of a light charge of electricity that only stuns others. A motor-propelled barge, carrying an alternating-current generator, was used in the tests, the generator discharging its current at the front of the boat, while a large seine at the rear caught the fish. The device can be used only at night, as a powerful light is employed to blind the fish so they remain within reach of the current.

LONDON'S SUNSHINE MEASURED BY SMALL GLASS BALL

One of the most difficult tasks in London is carried out daily at the air-ministry offices where the amount of sunshine penetrating to the city is measured. The measuring apparatus consists of a small glass ball through which the heat of the sun passes to burn a special paper placed beneath it, the mark on the paper being used to compute the amount of sunlight passing through the ball.

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Inserting a Paper beneath a Glass Ball Which Records the Amount of Sunshine London Gets

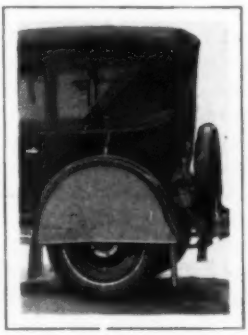
"Miss Britain I" in Action; This English Racing Motorboat, Which Resembles a Flying Fish When in Motion, Won One of the Events of the Harmsworth Trophy Races in Detroit Recently

RACING BOAT LIKE FLYING FISH TRIUMPHS FOR ENGLAND

One of the most unusual craft participating in the Harmsworth trophy races at Detroit a few weeks ago was the English racing motorboat, "Miss Britain I," which won a point score victory in the contest for five and one-half liter hydroplanes. It is equipped with a standard six-cylinder engine weighing 900 pounds and developing 120-brake horsepower. It has dual rudder control, the fore rudder being operated with the feet, while the stern rudder is offset on the starboard side, the blade being set at an angle to remove it from the propeller slip stream when running straight. In a turn to port, the blade is thrown into slip stream, enabling quick change of direction.

SPLASHERS FOR AUTO WHEELS PROTECT FINISH OF CAR

To protect the automobile from mud, dust, side and back splashing, spray, road oil and flying gravel, wheel splashers which attach to the sides of the fenders instead of the ends like mud guards are now being offered to motorists. The splashers, made of waterproof colored materials to match the car, are contained on wire frames conforming to the contour of the fenders, and are attached to the under side of the fender with keys which hold them in position. They extend well down over the wheels and can be removed in a few minutes for wheel or tire repairs. For business purposes, the splashers can be used for advertising, thus making unnecessary the printing of signs in permanent form on the car. They may be used also, when desired, with regular mud guards.



¶Synthetic rubber, made by mixing potato starch with chemicals, has been found to differ from real rubber only in that it is less elastic.

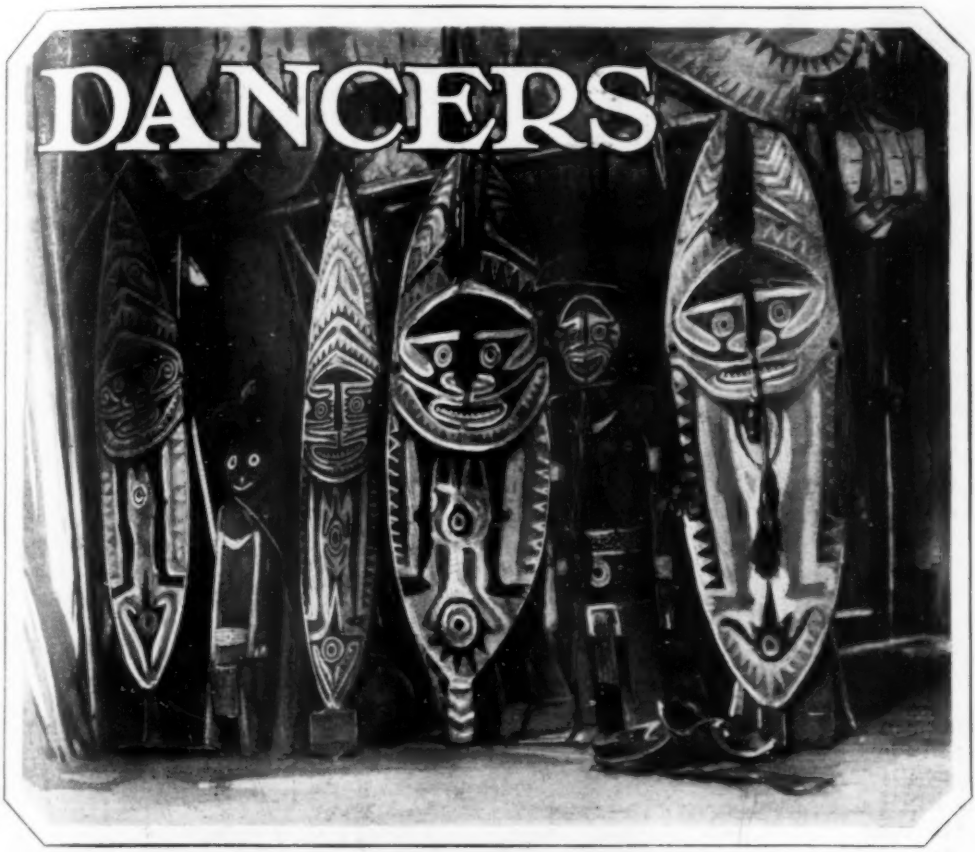
With the DEVIL

Seventy-Five-Foot Image of "King of the Devil," Used in Siamese Ceremonies, and, at Right, a Witch Doctor of the South Sea Islands

WHAT is the secret of the dark magic that holds its sway over the jungle tribes of Africa and other countries? Does the witch doctor possess "supernatural" powers, strange knowledge, that enables him to effect cures and perform other wonders that modern science sometimes is at a loss to explain?

These questions are being asked as expeditions into hitherto little known lands of the tropics become more common and tales of the witch doctors and their rites are circulated more widely.

Curious relics of the days before civilized man realized that the universe is ruled by natural law instead of by awesome spirits, are seen in scores of superstitions, still common property of the human race. It was not so long ago that no ships sailed on a Friday. People knock on wood, are suspicious of black cats, refrain from walking under ladders, fear a broken looking glass and carry all sorts of good-luck charms, more or less in fun, to be sure, but largely because the white man, as well as the black, once was ruled almost wholly by fear and superstition.



Grotesque Masks, Shield and Effigies Used in Various Ceremonial Rites and Dances: They All Have Symbolic Meanings, Important to the Natives

Africa, home of the witch doctor, is the great stronghold of dark magic today, and science is taking an increased interest in the riddles it presents, because, in their solution, may be found information that may help the white man, and the study reveals interesting stages in the development of the human mind. There is adventure in it too, for few white men have ever been permitted access to the secret lore of the witch doctors and their followers.

Scientists who have studied the question are fairly well agreed that the chief basis for the power of the witch doctor lies in the psychological grip he has on his fellows. The natives have implicit faith in his ability and, due largely to the laws of chance, his charms and incantations frequently seem to work. Take the case of an Indian tribe in this country. Some of their medicine men became widely known for their apparent ability to control the weather. They could cause rain in dry seasons or dispel storms at will, so it was reported. A number of eastern scientists witnessed actual demonstrations of the rain makers at work. They acquired one of their "rain bundles," a packet of sticks supposed to have a potent effect on the elements, and returned with it to New York. They were warned by the Indians not to open the package without observing the rites supposed to accompany such a ceremony. A few days after the party returned, the bundle was opened in the basement of a large museum in New York. While the sticks were being exposed, the city was shaken with one of the worst electrical storms of the season. Purely a matter of chance, the scientists knew, but had such a coincidence occurred on the prairie, it is not difficult to understand why the other Indians would have had

greater respect for the powers of rain makers.

In Africa, a warrior suddenly falls under the spell of an evil spirit, so he believes. He visits a witch doctor and is told that he will die. Although he was healthy and happy a few days before, he languishes and in a few short weeks, or less perhaps, he is dead. Cases like this have been observed repeatedly by civilized physicians and travelers, and are ascribed largely to the effects of fear.

One day a native of New Guinea entered a white hospital with a fervent plea to the doctor in charge that he remove a stone, which he said, an enemy had placed in his side. The physician could find no such obstacle, but the man refused to be relieved or dismissed on the ground that his ailment was purely a matter of his imagination. The doctor was something of a sleight-of-hand performer as well as a surgeon. He went through the movements of a fake operation and, at the proper moment, produced a small pebble which he had concealed in his clothing but which he told the patient had come from his side. Satisfied, the sufferer left the hospital entirely relieved of his pain.

In Africa, the witch doctor's power is explained partly on the ground of psychology, but white men have found that many of these individuals possess a curious knowledge of drugs, poisons, and other substances that aids them in their work. Just as witch hazel, quinine, and other materials, widely used among civilized people of today, were first employed by savages, so the witch doctor of Africa, it is believed, may be employing substances that will profitably repay further scientific analysis and study.

Dr. Mary F. Cushman, Congregational medical missionary, who has spent more than seven years among the people of Angola, on the west coast of Africa, recently told of some of the strange cures effected by witch doctors and of the use of poisons among the people there—potions that white doctors do not know how to duplicate. A man will sprinkle poison

Parrot-Feather Headdress; a Devil Mask from Thibet, and a Sorcerer of Papua

on the doorstep of an enemy. The substances, coming in contact with the soles of the feet will often produce serious and possibly fatal results. A man will walk up to another and greet him with an apparently friendly slap on the shoulder. But in a short time, the man who was thus greeted becomes ill, his arm and shoulder swell, and death may occur. A strange poison, carried in the palm of the hand by the man who greeted him was forced into the skin by the slap.

"Among the strange cures credited to the witch doctors, I recall an especially interesting one," said Doctor Cushman. "A man had been suffering from tuberculosis of the bones and had visited all the white doctors without success. Finally, he appealed to a native witch doctor, took his course of treatment and was entirely healed. Asked what the native had done to him, the patient could only say that the doctor had 'placed something in his sores that caused them to run with water for days.' The cure was entirely authentic and the case was investigated by a number of white physicians. Of course, the witch doctor would not tell what he had done. None of them reveals his secrets. If by any chance, they become converted to Christianity, they burn all their regalia and refuse to discuss their former professional life with anyone."

According to Doctor Cushman, there has yet been no thorough scientific analy-

In Oval, Kepog Dancer of New Britain in Regalia of Flapping Ears, Leather Muzzle and Nose Piece; at Right, Devil Dancers of New Ireland in the South Sea Islands; These Men Are Held in Great Awe by Their Kinsmen

sis of the substances used by the witch doctors and scarcely anything is known of their secrets. Possibly they have something that would be beneficial to the white man just as was the steam bath, long popular among the Indians.

Witch doctors are consulted on matters of law as well as health. Look at one who has been asked to find out who was guilty of poisoning a member of a family. He wears a curious headdress, and to the accompaniment of drums and incantations, he sways back and forth, blowing at intervals on a small horn whistle and slapping the air with a whip made from a cow's tail.

The purpose of the whistle is to call up the spirits and the whip frightens away those that are not wanted. A skin, probably that of a water rat, has been placed on the ground for the proper spirit to sit upon, and, when it has arrived, the witch doctor starts the serious business of finding the guilty person.

He does this by tossing a small basket, partly filled with charms. If a spear head comes to the top of the heap in the basket, it signifies that a man was guilty of the crime. A small bit of basket would indicate a woman. A spool would mean a white man, but the spool would quickly be thrown aside for, to the people of Angola, the white man is a member of the race of "Ovim dele," "big devils that came out of the sea," and they are not to be molested under the penalty of severe punishment.

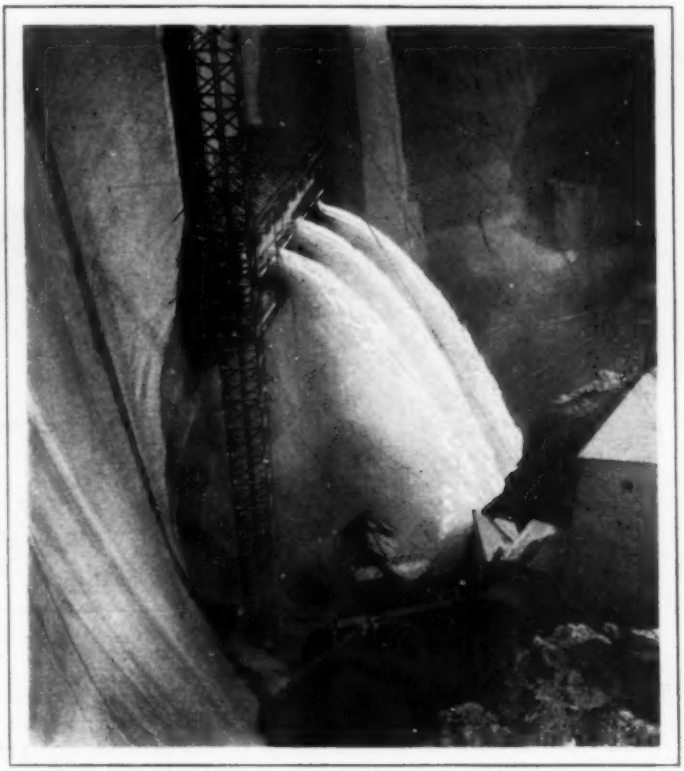
Possibly a little wooden idol would appear at the top of the basket. That would indicate that a ghost poisoned the victim. In such a case, the doctor would have to consult the image of the first witch doctor, a curiously carved figure of a man with the feet and legs pointing in the wrong direction. To determine the penalty to be paid after the guilt of the person has been determined, the basket is shaken again.

A corncob appearing at the top would demand that the fine be in corn; a chicken's foot would indicate that fowl would have to be paid, and a hoof signifies that an ox must be forthcoming. The witch doctor is wise in the ways of his people, and he is an expert at shaking the basket.

Natives of Palm Island off Coast of Australia; Their Chests Are Decorated with Bits of Cotton Stuffed into Blood Clots Drawn from the Flesh

Oddly enough, Doctor Cushman relates, if wealthy persons are involved, the hoof generally comes to the top of the basket. The other objects that appear seem to follow pretty closely the ability of the accused to pay. When guilt finally has been fixed on some individual, a test is made to prove the validity of the witch doctor's findings. He, by the way, receives a fee for his offices. Poison is given the accused one. If he dies, then the spirits were right, the man was guilty. If he lives, his innocence has been established. In this and other phases of the African practice of magic, is seen a curious resemblance to witchcraft that flourished in this country and Europe not so many decades ago.

The methods of the witch doctors vary in different parts of Africa, but the voice of the tomtom speaks a more or less universal language throughout the jungle. Code is pounded out on these drums by experts who can make the beats heard for miles into the forests. It was reported that word of the victory of Jack Johnson over Jim Jeffries was relayed throughout Africa by tomtom within a few days after the event happened.



Spillway of Seattle's New Diablo Dam in the Cascade Mountains: It Is 389 Feet Tall, the Highest Arch Dam in the World

ULTRAVIOLET RAYS ARE USED TO TELL TREE TROUBLES

Ultraviolet rays have been employed successfully by a Russian expert in tree diseases in identifying the particular growth causing any specific kind of tree rot. He found that healthy woods do not react under the rays, but infected woods fluoresce, the different colors of fluorescence identifying the particular rot attacking a tree. The substance causing the tree disease has a property that will change the wave length of the invisible ultraviolet rays into rays that can be seen.

HIGHEST ARCH DAM RESTRAINS A SIX-MILE LAKE

Forming a lake six miles long, Diablo dam, the highest arch dam in the world, recently was placed in operation in the Cascade mountains where it was built by the city of Seattle at a cost of $5,000,000. It is 389 feet high, 1,180 feet around the top, 140 feet thick at the bottom, and holds 90,000 acre-feet of water which will deliver 225,000 horsepower to giant turbines now under construction. It forms a part of a $25,000,000 municipal hydroelectric project on the scenic Skagit river which calls for another dam to be started soon several miles behind Diablo, the second dam being 500 feet high. Diablo is situated in one of the most isolated parts of the mountains and is reached only by a small city-owned railway line.

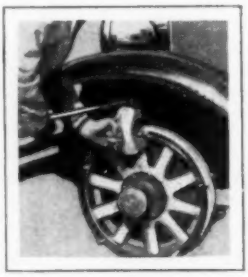
¶Ice-cream suckers placed on sticks of gum instead of wooden sticks are proving a popular novelty among children.

Foundation for a Mechanical Orange Grove; Porous Pipe Carries Water to the Squares Stuffed with Peat Moss, the Moss Taking the Water to the Surface Like a Lamp Wick Operates

LAMP WICK SOLVES PROBLEM OF CITRUS IRRIGATION

Conceived by watching the operation of an ordinary kerosene lamp, a mechanically grown orange grove is being constructed in California to mitigate the first menace. Surface irrigation of orange groves not only wastes about fifty per cent of the water, but chills the plants and retards growth. W. E. Davey, tree expert, solved the problem of getting water to the roots where it was needed by watching oil creep up the wick of a kerosene lamp. The scheme was first tried on a lawn where the ground was cleared away and water mains were installed with jets leading into rows of porous tile. Over them were placed the "wicks" in the form of strips of building board, six inches apart, between which German peat moss was stuffed. Soil then was spread over the surface and the grass planted. The water from the mains passed through the porous tile, saturated the wicks and thus seeped to the surface. The system is being used on golf greens with success. The plan then was adapted to the orange grove, where it will have the additional advantage of combating frosts, since the grove will be heated at the roots by using warmed water, and ground and air will be warmed by this artificial means. The process not only saves water, but allows fertilizer to be placed at the roots where it belongs, and permits the plants to breathe ordinary air in summer and warmed air in winter without the use of smudge pots, which cut off the sun's rays and do not allow the fruit to develop fully, when they are used to prevent frosts. The form of irrigation also eliminates most of the need for surface cultivation of orange groves.

TIGHTENER FOR AUTO SPOKES DOES TASK QUICKLY



Working on any wheel having a metal felloe, an auto-spoke tightener now does in ten minutes what formerly took a much longer time. The use of the tightener eliminates wedges, shims and other temporary methods of tightening, and large brake drums do not interfere with its operation.

PUMP ATOMIZES OIL TO RAISE IT FROM WELL

Petroleum is brought from the bottom of deep wells to the surface by atomizing it with air or gas in a turbine air-lift pump recently tested. Crooked wells that curve or spiral their way downward are very difficult to pump with sucker rods, but can be freed of their oil as easily as a straight shaft by the atomizing process. The pump is operated by air or gas pressure applied to an inclosed area in the bottom of the tubing. Air enters the pump through angular slots which turn a motor similar to a steam turbine. Oil is picked up by the motor, strikes the air column at the top of the pump and is completely atomized.

BIG SQUASH WINS BLUE RIBBON AT HISTORIC EASTERN FAIR

Farm and garden products still come in for a large share of the honors at Massachusetts' historic Marshfield fair, which maintains many of the features that made it famous in by-gone days. One of this year's blue-ribbon winners was a huge squash which walked away with first honors in its class. A prime attraction that persists at the exposition is sulky racing.

Large Hubbard Squash Which Took a Blue Ribbon at Historic Marshfield Fair in Massachusetts

This Fourteen-Year-Old Boy, Weighing 106 Pounds, Landed These Two Black Sea Bass, the Larger Weighing 212 Pounds

HUNDRED-POUND BOY SUBDUES TWO-HUNDRED POUND FISH

Loren Grey, fourteen-year-old son of Zane Grey, novelist and sportsman, was one of the proudest lads in the country recently when he landed two black sea bass from the same bait off the coast of Catalina island. One of the fish weighed 151 pounds and the other 212 pounds, while the boy that subdued them tips the scales at 106 pounds.

SMOKE SCREEN ROUTS INSECTS WHICH ENDANGER FLYERS

Mosquitoes often disrupt Alaskan airplane schedules in late summer when wet weather has left landing fields dotted with pools where the insects breed rapidly. They congregate in intense swarms and fill the air in cloud formation until pilots often fear to take off in their midst. To rout them, a smoke screen is laid over the field before a take-off, the insects being overcome as the smoke drifts away.

HALF-INCH PIECE OF SUN WILL GUIDE NIGHT FLYERS

Standing atop a Chicago skyscraper, 600 feet above Michigan avenue, the Lindbergh beacon is the most powerful beam so far constructed for guiding flyers at night. The concentrated brilliance given forth by this arc of 1,600,000,000 candlepower is practically equivalent to removing a half-inch piece from the sun and using it as a light source. If the beam was thrown on an object or group of people fifteen miles away, instantaneous photographs could readily be taken. At fifty miles a newspaper can easily be read by its illumination. Focused on the horizon, the beam would strike the earth about thirty miles distant. Therefore, the light is tilted two degrees upward to avoid the possibility of highway accidents. Theoretically the beacon is visible for 500 miles, but at this distance, due to the curvature of the earth, the beam is forty-nine miles above the surface. So far, the physical endurance of man and his inventions have

Night Views of Chicago Showing the Intense Brilliance of the Lindbergh Aerial Beacon When the Beam, atop a Michigan Avenue Skyscraper, Was Turned on Buildings below It

limited ascent to approximately nine miles, and so the light is lost in space long before its service as a beacon wanes because of diminished intensity. To a pilot flying at an average height of 3,000 feet, the flash is visible for about 100 miles in clear weather. The arc which gives forth this sunlike incandescence is only one-half inch in diameter. Installed beneath the revolving light is a small fixed beacon, which gives a beam candlepower of 11,500,000, focused constantly on the municipal airport southwest of the city.

PORTABLE WELDER RUN BY AUTO POWER

It is now possible to operate a portable welding outfit directly from the power supplied by an automobile or truck motor through a power take-off installed in front of the transmission. This drives a generator beneath the car seat. Thus a garage truck can go directly to the scene of a welding job and do the welding on the spot. Heating of the car engine at high speed has been overcome, and the take-off eliminates the necessity of bringing an extra motor for power on a welding job.

"CANNED SNOW" FROM TROPICS SENT NORTH FOR FREEZING

Two hundred tons of solid carbon dioxide, having a temperature of 140 degrees below zero Fahrenheit, arrived by steamer in New York recently, the first shipment from oil wells near Tampico, Mexico, where the frozen gas was formed. The substance is being used by food companies, ice-cream dealers and fruit and vegetable growers for refrigeration purposes. The gas was encountered while putting down an oil well. It rushed to the surface at a pressure of 1,000 pounds to the square inch, was compressed into liquid form and then expanded into artificial snow, which was blocked into cubes for shipment. An insulated hold was provided in the steamer to prevent the snow from melting and evaporating.

Electric Indicator Which Measures the Moisture Content of Wood; Spiked Hammer Is Contact Electrode

MOISTURE CONTENT OF WOOD MEASURED BY INDICATOR

To save time for those engaged in the woodworking industry, an electric indicator is being used successfully to measure the moisture content of wood. The instrument consists of a simple electric circuit which uses the wood as a resistor. The number of flashes in a tube in a unit of time indicates the moisture content. Headphones may be used with or without the lamp, the contact electrodes for the lumber being contained in four points on the end of a hammer.

SMELL OF SPECIAL LUBRICANT WARNS OF OVERHEATING

To prevent the overheating of bearings, a Scotch engineer has developed a special lubricant whose odor warns of danger. It is contained in a cartridge attached to a bearing and, in case of failure of the regular lubricating system, will flood the bearing with grease, at the same time giving off a strong odor which warns the machine operator. The lubricator is expected to prove valuable in marine engines.

Newspapers Sent

RADIO has advanced another step—a most important one so far as the ocean traveler is concerned. As a result, it is now possible to transmit and receive an entire newspaper by wireless, including not only reading matter, but cartoons and photographs as well.

Proof of the practicability of this development was given when the U. S. S. "America," of the United States lines, received successfully an eight-page newspaper, complete in every respect on a return voyage from Europe. The result was said to be one of the most important advances in the field of radio and one that will open an entirely new field of communication possibilities.

The apparatus that accomplished this new means of radio communication was developed by the Radio Corporation of America, under the supervision of Capt. Richard H. Ranger. The broadcast aboard the "America" marked the introduction of a regular news service not only on this ship but on others owned by the United States lines. Arrangements for installation on the other ships already are completed and work is proceeding as rapidly as possible.

The apparatus responsible for this latest radio achievement is of intense interest in itself. On the receiving end is a mechanism known as a "vapor receiver," which consists of an ink unit using liquid ink vaporized by means of blasts of air. The vapor is carried through a small rubber hose into a small glass nozzle, held to a base within one-half inch of a cylinder of paper. The ink shoots against the paper according to the dictates of radio signals, accomplishing the outlines and shadings of the orig-

Receiving a Newspaper by Radio, and Radio-Wire Photograph of King George Opening the Naval Conference

to Sea—by Radio

Save for the Small Lines Formed in Recording, Many Wireless Pictures Are Reproduced Almost as Clearly as the Original

inals. When the signal calls for white space, the ink valve remains closed.

Photographs transmitted in experimental work are very close resemblances to the originals. The principal difference is in the color of the transmitted likeness, which is in a purple ink, found to be most satisfactory.

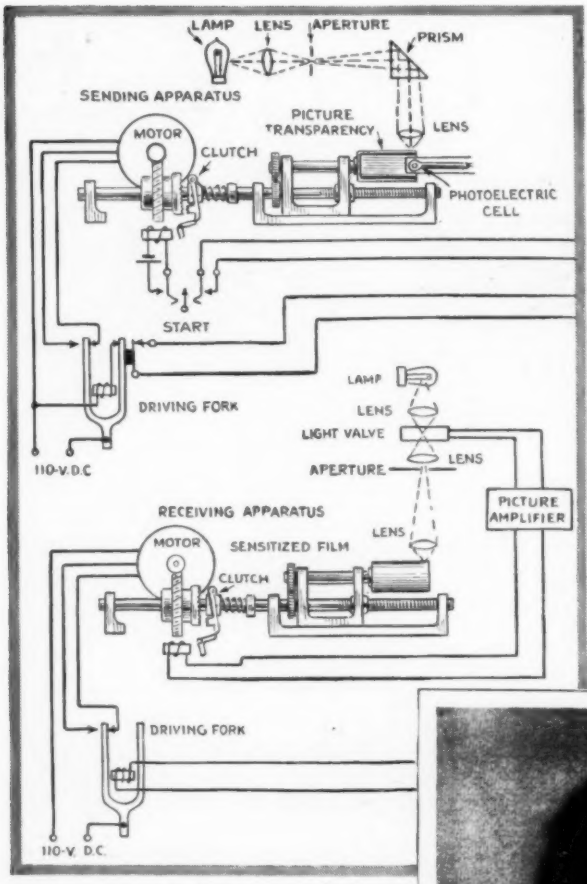
This system is an extension of the processes of sending photos by phone and cable which already has been put to wide use, as when King George addressed the opening session of the naval arms conference in London one forenoon, and next morning's newspapers in San Francisco, halfway around the world, published pictures of him speaking to the delegates in London.

A damage suit was on trial in Boston, a suit over a broken contract, and just as the trial was beginning, it was discovered that the disputed document had been left in New York. Ordinarily this would have meant a dismissal of the case or at least a postponement, but the attorney in this instance telephoned New York, and within an hour an exact duplicate of the contract, signatures and all, was in Boston and being submitted to the judge.

An ex-convict went into a store in Cleveland, Ohio, held up the proprietor with a gun and, after scooping up all the cash he could find in a hurry, made his escape. But it was only a temporary escape. Before he got out of town, his photograph and thumbprints had reached police headquarters in a wide circle of cities, and his capture became inevitable.

Stunts? Not a bit of it. These four incidents are all in a day's work with the telephone and cable companies which are now able to span land and sea as easily with pictures as with words. Indeed, this sort of magic has become such dependable service that editors, reporters, news photographers, police and detective agencies, style designers, lawyers, financial houses, and advertisers regard it as quite the routine thing to do when speed and accuracy are required.

An amusing story is told of the early days of the telegraph. Morse had just strung his wires from Baltimore to Washington, and most of the people thought him crazy. Two of the scoffers climbed one of the telegraph poles just outside



Baltimore and hung a pair of boots on the wire. "If this lunatic Morse can send words on that contraption," one of them remarked, "he ought to be able to send these boots to Washington too."

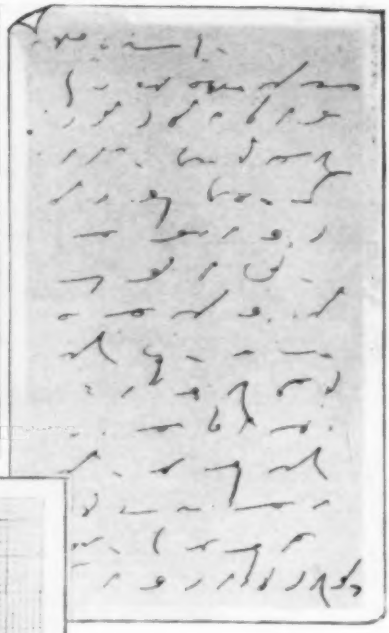
Today manufacturers and design experts are sending photographs of shoes over the wire; indeed, it is quite possible to send a facsimile of anything that can be photographed. Handwriting, typewriting, printed matter, blueprints, drawings, cartoons—anything that can be reduced to a photograph can be reduced also to a wire message and transmitted to a distant city.

Ripley, the cartoonist, was assigned to cover a sporting event in Chicago, and was eager to have his cartoons in New York for next morning's publication. He tells how he made his sketches at the ringside and fought his way through the crowd back to the Chicago Athletic Association, where he had a room reserved. There he completed the cartoon within half an hour—"perhaps the fastest picture I have ever done," he said later, in recalling the experience—then rushed it to the telephotograph station in Chicago. It was in New York within an hour, in good time to make the first edition of his newspaper. Ripley has several times since used this means of communicating his cartoons to a distant publisher with superspeed.

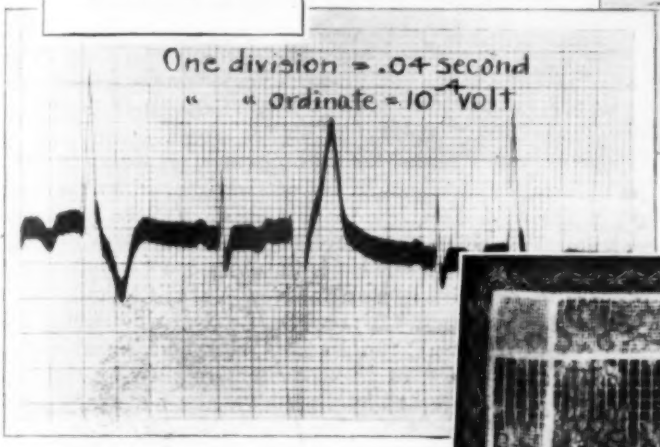
Many less famous than Ripley have used the wire to get the products of their penmanship or pencil delivered in a hurry. Sometimes a signature is required to authorize a business transaction,

Diagram of the Chief Parts of the Sending and Receiving Apparatus, and a Good Example of Radio-Reproduced Portrait

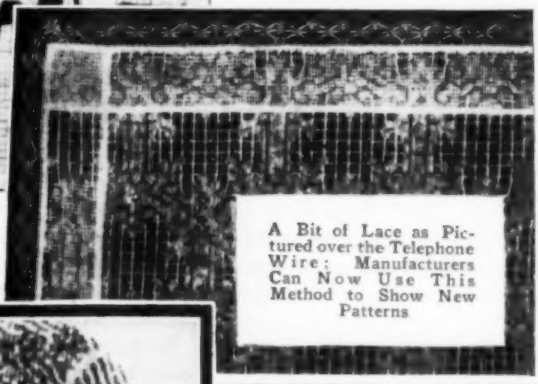
Telephotograph X-Ray of Fracture, Sent from New York to Cleveland by Consulting Surgeon



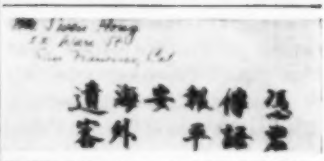
Page of Stenographic Notes Transmitted over Wire in Court Case



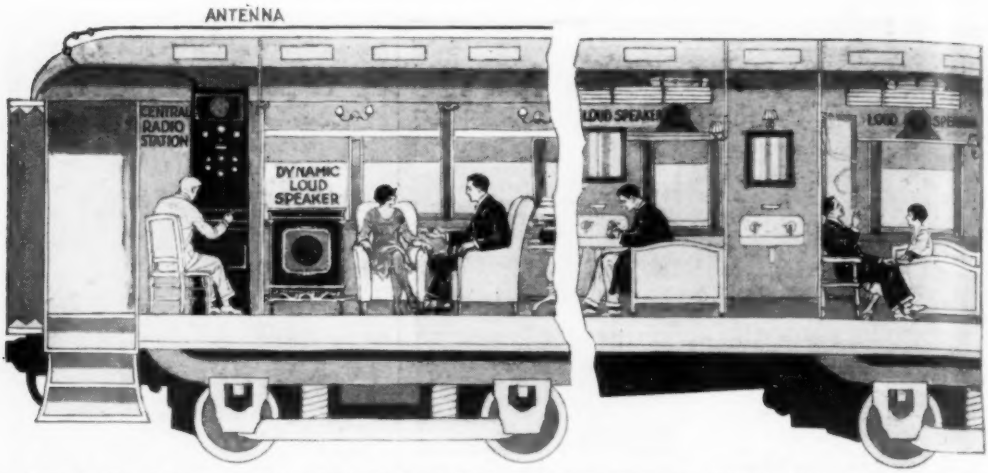
Scientists Use the Telephotograph to Send Reproductions of Charts, Chemical Formulas and Other Symbols



A Bit of Lace as Pictured over the Telephone Wire; Manufacturers Can Now Use This Method to Show New Patterns



Above, a Chinese Message Easily Reproduced by Wire, and, at Left, a Thumbprint Accurately Transmitted by Telephotograph; This Service Promises Great Aid to Police in Capturing Criminals and Identifying Them



Cross Section of Radio-Receiving Set in Railroad Car, and How Programs Are Distributed to Drawing Rooms and Compartments through Loud Speakers

a document is needed to complete a deal or to give evidence to the court. For instance, a New York man had been summoned as a witness in a court action in Los Angeles. He found it impossible to get away at the last minute, and by means of the telephotograph he sent a sworn statement of his situation, which saitsfied the judge and got him off without fine or reprimand.

Messages in Chinese, Japanese, Yiddish and Russian are a strain on the telegrapher. He can't fit these curious hieroglyphics into the Morse code, but they fit into the telephotograph transmitter as easily as any other picture, and they come out at the other end, 300 or 3,000 miles away, as legible as the original.

Then, there has come up this situation in which the telephotograph sometimes proves to be a life-saver, or at least a health saver. A dentist in an eastern city finds the condition of one his patients rather baffling, and an X-ray of the troubled tooth does not enlighten him. There is in a distant city a famous oral surgeon who is a specialist in this field. A diagnosis by him would be helpful, but the diagnosis is needed at once; there is no time for waiting on the mails. In this emergency, the X-ray photograph is put on the wire, within an hour it is in the hands of the distant specialist, and thus the consultation is facilitated swiftly, surely, accurately over several hundred miles of space.

Not long ago a surgeon in New York wished to get the opinion of a surgeon in Cleveland on a difficult bone fracture. He got it, quickly, by telephotographing an X-ray of the broken bone.

The telephotograph system in the United States was developed in the Bell Telephone laboratories in New York, under the direction of Dr. Herbert E. Ives. The service is in operation between eight cities: Boston, New York, Cleveland, Atlanta, Chicago, St. Louis, Los Angeles and San Francisco. Quick distribution from each of these centers to near-by cities is effected by air mail when necessary. Recently, for instance, a New York company wished to reach 1,300 dealers in Georgia with a special emergency announcement. It telephotographed the announcement to Atlanta at 8:00 p.m., and by nine next morning copies of the telephotograph had reached all of the 1,300 by mail and airplane and special messenger.

One of the choicest transcontinental telephone circuits is reserved for telephoto transmission, and it is nursed and coddled like a precious pet.

A few years ago, when the telephotograph service was being planned, it was supposed that the main user would be the press and the news-photo agencies. Accordingly, these prospective customers were asked what size of transmitted photograph would suit them best, and it was on their recommendation that the five by seven-inch size was fixed as standard. As it has turned out, however, only about one transmission in five is a photograph for

publication. The biggest demand for the service comes from the financial houses, banks, security houses, brokers, and financial advertising agencies.

While news pictures are only a fraction of the traffic over the telephone wires within the United States, they constitute practically the entire cable-picture transmission between the United States and Europe. This cable service is an entirely different and independent service from that of the telephone system. It uses the Bartlane process, so named from the two inventors, H. G. Bartholomew, of London, and Capt. M. D. McFarlane, formerly of London but now of New York.

In Europe a considerable picture-transmission system has been developed over the telephone lines. Commercial stations are maintained in London, Glasgow, Manchester, Swansea, Berlin, Stockholm, Vienna and Rome. The Paris station is owned and operated by the New York Times. In London, several of the newspapers have private stations connected with similar stations in provincial cities, and these publications regularly depend on the wires for many of their photographs.

Occasionally it happens that all these services—in Europe, across the Atlantic, and in America—will be called into action to get a single photograph delivered to a distant part of the world. The departure of the "Graf Zeppelin" on its first transatlantic trip was the subject of such a transmission—from Berlin to London by phone, London to New York by cable, and thence to San Francisco by telephone.

New stations are projected for several additional cities in Europe and in Asia and Australia. Eventually it should be easy to flash a face or a thumbprint or a signature, even as now we flash words, by the power which courses through our telephone and submarine-cable wires.

Courtesy Eastman Kodak Co.

Walls of a Dining Room Decorated with Inexpensive Photographic Mural Panels Which Are Enlargements of Actual Photographs

PHOTO MURALS ARE NEWEST WALL DECORATION

Large photographic murals are being used for wall decorations, taking the place of the more costly paintings for dining and drawing rooms, and also for decorative screens. In business offices, the photograph enlargements appear in the form of gigantic maps and factory buildings. The pictures are made in a horizontal enlarging machine, using eight-by-ten-inch plates or films, and the sensitive paper is tacked to the entire side of the dark room. After exposure, it is placed in monster tanks requiring many gallons of developing fluid. They are applied to walls in the same manner as wall paper and are surrounded by ornate paneling to conceal the edges. The method is inexpensive as compared with the cost of wall paintings, and it is also possible to obtain exact reproductions of expensive paintings that could not be correctly duplicated otherwise.

¶Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information.

Girls Marking Their Score in "Snooker Golf," Which Combines Features of Billiards and Golf in One Game

BILLIARDS AND GOLF COMBINED ON MINIATURE COURSE

"Snooker golf" is the name of the latest variation of the miniature-course game, and it combines some of the features of both billiards and golf. The course is laid out like the conventional billiard table with concrete edges on the lawn corresponding to the edges of the table, and the usual number of pockets or holes about the sides. Sixteen balls are used, being racked in a triangle and broken at the start of play, as in pool. The cue is the putter and the cue ball is an ordinary golf ball. Balls of different colors count different scores in scoring. Overhead, strung on a wire, are standard billiard counters.

LEPROSY PROTECTION OFFERED BY A VITAMINE DIET

Hope that leprosy may be conquered is contained in reports from Japan that Dr. K. Shiga, dean of the medical faculty at Seoul, Korea, has discovered that vitamines in sufficient amounts will prevent infection of animals, and presumably man, with leprosy. Although the leprosy bacillus was found more than fifty years ago, it had been impossible to transmit the disease to lower animals by inoculation, which led to the assumption that a special individual susceptibility is requisite to contracting it. Doctor Shiga verified this when he inoculated normal, healthy rats with bacilli and they showed no signs of the disease. Later, after their food had been deprived of vitamines, they were inoculated again and soon developed it. If such a dietary deficiency accounts for susceptibility, it will be possible to protect all people from the disease.

ONE-HAND PUMP MAKES AUTO OILING EASY

Eliminating body squeaks in automobiles and oiling springs and steering gear is simplified with an oiler which requires but one hand to operate. It contains a pump which is operated by the hand holding the oil container, leaving the other hand free to direct the stream of lubricant. It holds two-thirds of a gallon, is equipped with a hose, and can be operated from any position about the car.

Lightweight Automobile Oiler Containing a Pump Which Can Be Operated with One Hand

QUEER THINGS THAT FALL FROM THE SKY

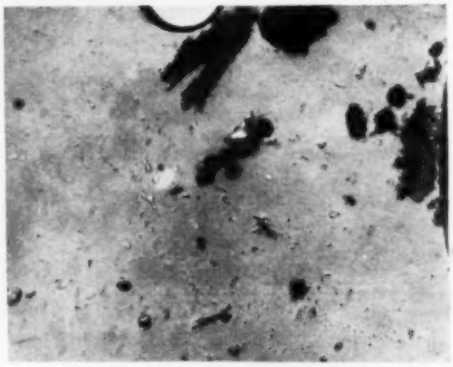
WHEN the newspapers report that fish have fallen from the sky, they are not necessarily indulging in a fish story. And when, last spring, press dispatches from a place in Colorado stated that a great shower of sulphur had occurred there, the tale was not hatched out of somebody's fervid imagination. A yellow powder resembling sulphur actually fell in abundance, but microscopic examination proved it to be pollen, blown from pine trees growing some miles from the place of deposit.

Similar showers of so-called sulphur are common. So are showers of something that bears a certain resemblance to blood. In other cases, things that fall from aloft, or that are found on the ground and are supposed to have fallen, include fishes, frogs, toads, tadpoles, insects and grain, besides substances mistaken for flesh, milk, ink and paper. Showers of "manna" did not cease with Biblical days, and there are several other items on the list of things occasionally reported to have fallen to the earth after the manner of rain.

Old Drawing of Rain of Fishes, and Waterspout That Draws Objects from the Sea

It is easy to understand why our primitive ancestors, who were completely under the influence of superstitious ideas, saw prodigies and portents in the real or supposed

fall of terrestrial objects from the skies, but it is not a little strange that, in our own times, the public should regard such events as mysterious or semi-miraculous. The explanations are, as a rule, quite simple.



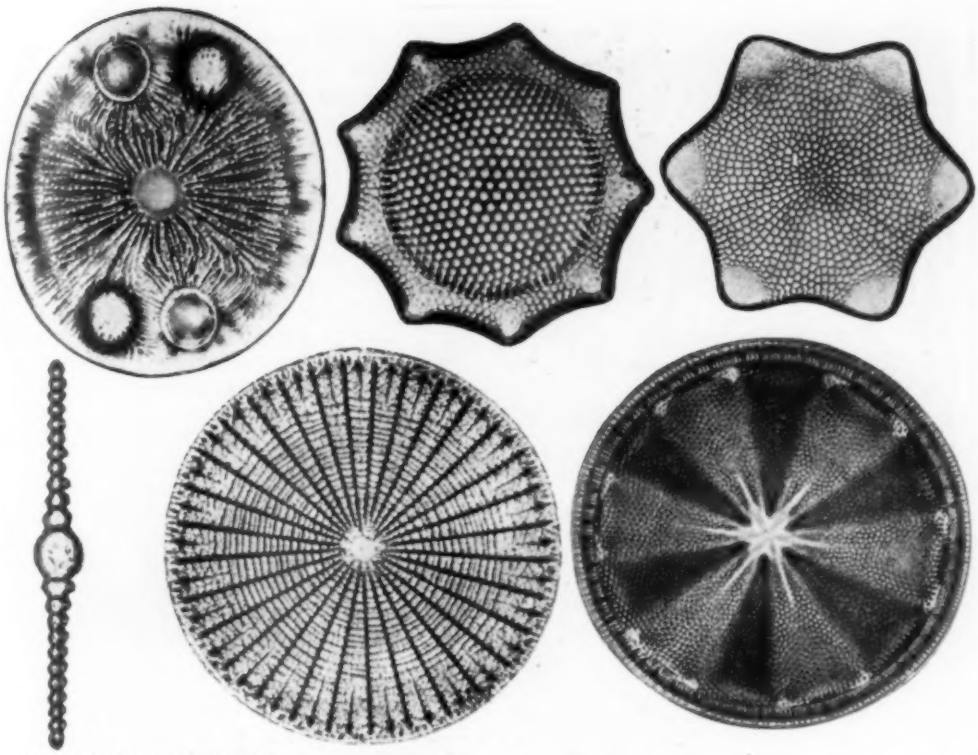
Let us consider first of all the pollen showers already mentioned. It is a well-known fact that while some plants, especially those with showy flowers, are pollinated by insects, there are others that depend entirely upon the winds to transport their pollen from flower to flower. Wind-borne pollen of many species causes hay fever, and studies recently made of it with reference to this effect have yielded some rather astonishing information as to the amount of pollen present, at times, in the air and the distances to which it may be carried by the winds.

Pines and some of the other conifers are among the most prolific of pollen producers. The air in the vicinity of a pine forest is sometimes filled with visible clouds of this substance, and the wreathing columns of it rising from the trees have been mistaken for the smoke of a forest fire. Pine pollen once fell in such abundance at Pictou, N. S., that bucketfuls were swept up on the deck of a ship. The town of Lund, Sweden, is said to have been showered with pollen from a pine forest thirty-five miles away.

What winds of ordinary strength do with pollen, those of exceptional violence are capable of doing with much heavier objects. W. L. McAtee, of the U. S. biological survey, in discussing this effect of the winds, tells of seeing a silk hat lifted from its owner's head and blown over a ten-story building in the city of Washington. The vortex of a tornado or a waterspout furnishes the most favorable skyward route for things that belong on the earth or in the water. Objects weighing scores or even hundreds of pounds are lifted by these whirls. Within a mile or so of a tornado, a shower of cartwheels or cookstoves would not necessarily constitute a prodigy.

A chicken coop weighing seventy-five pounds has been carried four miles by a tornado and a church spire

Collecting Pollen by Airplane; Bits of Plant Material from Air, and a Shower of Rats



Courtesy the Carnegie Institution

Diatoms, Highly Magnified; These Beautiful Particles Are Often Found in Deposits of Atmospheric Dust and Revive the Notion That a Zone of Living Matter Exists in the Upper Air

seventeen miles. The Danish scientist Oersted tells of a waterspout at Christianso, on the Baltic, that emptied the harbor to such an extent that the greater part of the bottom was uncovered, and many cases are known in which waterspouts or tornadoes have completely drained small ponds. In such cases, quantities of fish and other aquatic creatures are sure to be whirled aloft, and "what goes up must come down." Usually, of course, the falling objects will be widely scattered and most of them will escape notice, but occasionally a large number will fall at one spot and their fall will be observed.

The real mystery about rains of fishes is that they are not a good deal more common than existing records indicate them to be. Dr. E. W. Gudger, of the American Museum of Natural History, has for years pursued the hobby of collecting reports of such events from the literature of all ages and all countries. Up to last December, he had found records of only seventy-three cases, ranging in date from about 300 to 1928 A. D. The last known shower of this kind scattered several hundred small fishes, some alive and some dead, over a cottonfield in North Carolina. In this case, the nearest body of water, three-quarters of a mile away, was not known to contain many fish.

Showers of frogs, toads, small reptiles, earthworms and animals of other kinds have occasionally been reported by eyewitnesses of these events, whose descriptions leave no doubt that the creatures actually fell and were not merely assumed to have fallen on account of their sudden appearance in large numbers. A shower of insects that occurred at the town of Szentes, Hungary, Aug. 14, 1901, is said to have covered the ground a foot deep. Showers of rats and mice have been reported, but not in modern times, and details of these occurrences are lacking.

Among the supposedly miraculous showers recorded in medieval chronicles, so-called rains of blood are much the most

numerous. In the majority of the cases reported from southern Europe, the alleged blood was undoubtedly rain reddened by dust blown across the Mediterranean from the Sahara desert. Red showers of this kind are still of recent occurrence. The most remarkable one of recent times prevailed over central and southern France on Oct. 30, 1926. It was interesting to note on that occasion that, although the European newspapers and even the scientific journals almost universally referred to the event as a "shower of blood," this expression was used in a purely conventional sense, and no attempt was made to invest the affair with a miraculous character.

In showers of so-called ink, the deposit consists of rain blackened with smoke or soot, while a mixture of rain and chalky earth results in a shower of "milk." Dustfalls, with or without the accompaniment of rain, are often very striking events. In some cases, millions of tons of solid material, transported from distant deserts, dry plains or volcanic eruptions, are deposited over thousands of square miles of the earth's surface.

In the middle of the last century, a study of European dustfalls was made by the German naturalist C. G. Ehrenberg. In his microscopic examination of the dust deposits, he found immense numbers of diatoms, some living and many belonging to species supposed to be peculiar to regions as far away as South America. He was thus led to adopt the curious hypothesis that a permanent "zone of living matter," replenished from time to time by the winds, exists in the upper atmosphere, and that dust showers occur when this stratum is so distorted as to come in contact with the earth. This notion has cropped up again within the past few years.

While, as we have just seen, objects and materials in great variety undoubtedly fall at times from the sky, there is a large proportion of cases in which the source of so-called "showers" is at or near the earth's surface. Thus it is not uncommon to find the earth or pavement under trees sprinkled with drops apparently due to miniature rainstorms, but actually consisting of honeydew ejected by swarms of aphids, scale insects or leafhoppers. The stuff is sweet and sticky, and explains the showers of "honey" recorded in the old chronicles.

Old Drawing of a "Shower of Blood" in Provence, and a Source of "Honey Dew;" an Aphid and Her Eggs

The manna of the Bible was thus produced by scale insects, which exude from their bodies a clear juice that falls to the ground in drops. These drops harden into sugary grains, which the Arabs of the Sinai peninsula still gather for use as food and medicine. Another kind of manna consists of lichens of the genus Lecanora, forming small round bodies that are easily blown over the ground and accumulate in hollows in such quantities as to suggest the idea that they have fallen from the sky.

In the case of some alleged showers of paper, the material has been found to be the crusts of dried algæ, which form on the surface of the ground exposed by the evaporation of the water of shallow ponds.

Lastly, some of the reputed rains of blood are due to the deposit of a red fluid ejected by certain species of moth emerging simultaneously in large numbers from their cocoons, and still others to the rapid multiplication in rain pools of algæ and rotifers containing red coloring matter; while the "flesh" that has occasionally been supposed to fall from aloft probably consists in most cases of the jellylike material (zoogloea) sometimes formed by colonies of bacteria on the surface of water.

MAGNETIC STORMS ARE CAUSED BY ELECTRIC RING

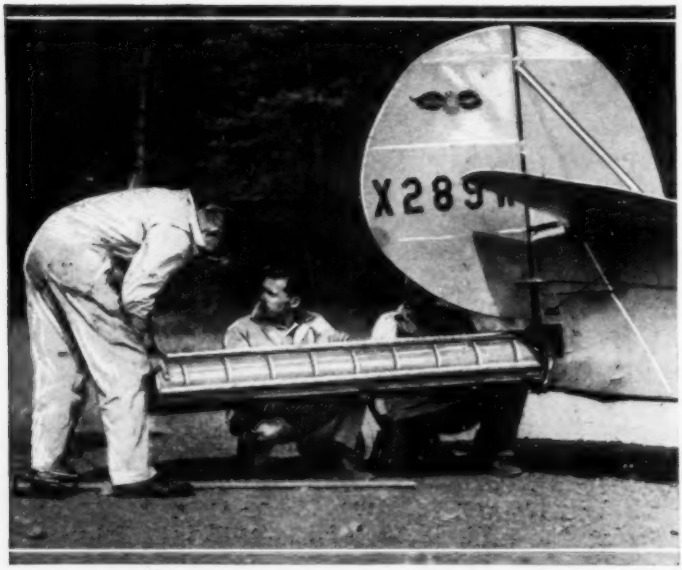
Two English physicists have formed a theory that a ring of electric current, surrounding the earth in much the same manner as the more material rings of Saturn surround that planet, cause the magnetic storms that upset cable and telegraphic communications. They believe this current occurs in a stream of neutral ionized particles shot out by the sun. As the stream advances toward the earth, the magnetism of that body sets up electric currents in its forward part, and the stream then envelops the earth, possibly approaching as close as the upper layers of the atmosphere. The flow of the current in a westerly direction around the earth sets up magnetic effects that produce the main phenomena of a magnetic storm, the scientists believe. It has been suggested that since magnetic storms frequently are associated with sunspots, it is possible the ionized particles are shot from these spots. At an estimated speed of 620 miles a second, they would reach the earth from the sun in about forty hours.

Trunk of an Oak Tree Whose Natural Contour Provided the Outlines for the Many Fairyland Figures Carved by a Scottish Artist

CARVINGS ON OAK TREE DEPICT FAIRYLAND CHARACTERS

For the entertainment of children, a Scottish artist has covered the trunk of an oak tree in Kensington gardens, London, with carvings representing numerous figures and characters of fairyland. A hole in the center of the tree has been transformed into a feasting hall for the king of fairies, and other figures include rabbits, elfin pipers, winged fairies, a bear and a witch, as well as woodpeckers and other birds. The natural contour of the oak provided the rough outlines from which some figures were carved.

¶Science has determined that it takes 369 pounds of moisture to produce one pound of dry matter in a corn plant.



The Metal Tube Being Attached to the Airplane, Contains a Large Parachute Which Will Land the Ship if Its Motor Fails

PARACHUTE TO LAND AIRPLANE WHEN ENGINE FAILS

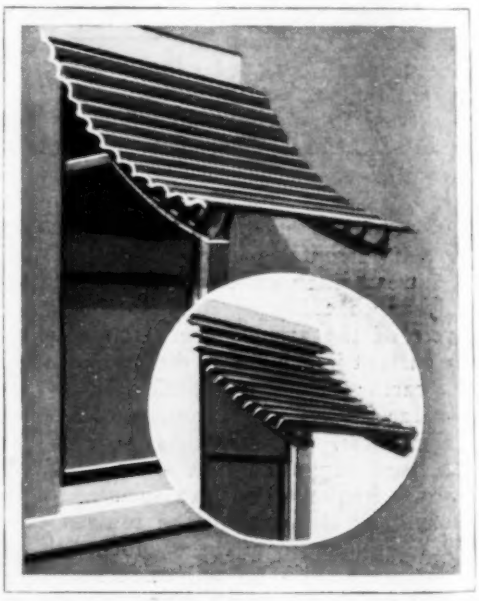
Airplanes, like flyers, soon may take to parachutes when disaster overtakes them in the form of engine failure or other emergency. Tests are being made at Detroit with a parachute which lowers an airplane to the ground along with the pilot and passengers. The parachute is carried in a metal tube under the tail of the ship. When the flyer pulls a release cord, a small pilot parachute catches the air and drags the large one from its container. Heavy ropes from the silk to the plane support the ship as it drops.

DYES FROM CASTOR OIL

Dyes have been made from castor oil by chemists of the Presidency College in Calcutta, who obtained a brown powder which gave an orange tint to wool and silk. Coconut oil yielded a brighter orange color, while olive oil made a brown dye for wool and stained silks in various shades of red. High yields obtained in the laboratory, and the ease with which the dyes may be made from fats, suggest the process may be of commercial importance. Oil fats have an advantage over coal tar, since the supply is being replaced continually by nature, and many oils can be obtained at a lower price than ordinary dye materials. In making the dyes from fats, esters of benzoic and other acids were used instead of the acids themselves.

AWNING-SHUTTER STOPS WIND AND RAIN

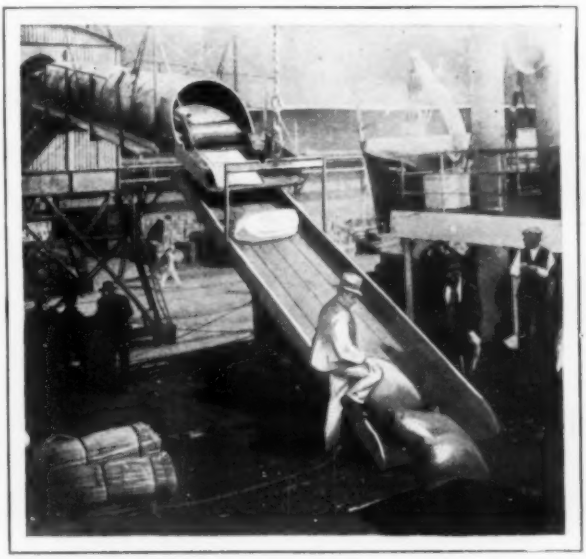
Combining some of the features of a shutter and an awning, a metal shade is capable of stopping wind and rain and has the additional advantage of being fireproof. It is made of galvanized metal sheets and strips, and can be used as a shade by raising an adjusting lever which causes the shutter to close and bond together, affording protection from sun, rain and wind. Opening of the shutters allows the light and air to be admitted. Curved frame construction, and the extension of the shutters beyond the opening covered, offer protection from the sun when the rays are directed from the side.



Metal Awning That Combines Features of Both Shade and Shutter and Also Is Fireproof

ELECTRIC LIGHTS BLOWN OUT WITH PUFF

Blowing out the electric lights is no longer a joke. An electric light that can be blown out with the same small puff that extinguishes a match is on exhibition at the Westinghouse Lighting institute in New York. It utilizes an electric switch known as a "breath relay" and can be set so a breath of air turns it on or off. Many useful applications are predicted, for it gives man a third hand for some kinds of mechanical operations. It can be used for safety devices, and for extending the operator's control of an automobile, airplane or scientific apparatus in which hands and feet are busy. It also can be made to actuate devices which open doors, and to operate the carriages of typewriters, or to turn the pages of sheet music. For extinguishing the lights the operator blows into a small funnel resembling the mouthpiece of a telephone. The breath strikes phosphor bronze springs arranged so that the air impact hits a large surface and is amplified sufficiently to make or break a contact. The position of the springs protects them from being affected by ordinary air currents.



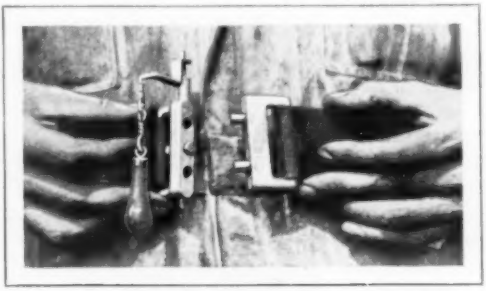
Mechanical Ship Loader Which Combines Moving Belt and Chute to Convey Cargo from Warehouse to Vessel

BELT AND CHUTE CONVEY LOAD FROM WAREHOUSE TO SHIP

Reducing the labor and expense of loading a cargo aboard a vessel, a mechanical ship loader is being employed successfully with certain types of freight not too bulky for its use. It consists of a moving belt inside a covered passage which brings sacks of grain or other material from a warehouse, and a long chute on which the belt dumps its load and down which it is conveyed to the hold of the vessel.

AIRPLANE SAFETY-BELT LATCH OPENS IN A JIFFY

Instant release of the safety belt so that the occupant of a plane may quickly climb out in case of an emergency is possible with an improved catch invented by an eastern man. A quick pull on the fastener breaks the connection instantly but there is no likelihood of the belt giving way accidentally. The catch withstands a strain of several thousand pounds, tests have shown, and it is said to be much more quickly unfastened than the usual attachment on safety belts.



Improved Catch for Safety Belt Used by Flyers, Which Is Released by a Pull in an Emergency

METEORS EXPLODE AS THEY HIT IS VIEW OF SCIENTIST

Meteor crater, near Winslow, Ariz., was produced by about 300,000 tons of meteors, in a close swarm, exploding as they hit the earth with a force as violent as 400,000,000 tons of high explosives. This is the opinion of Dr. Forest R. Moulton, former University of Chicago professor, who has made a study of the crater, nearly a mile in diameter.

I Win

Inspector Read Giving Instructions for Flight Test, and Drawing of Spiral, the Final Problem in the Flying Examination for Private Pilot's License

By PAUL D. PADDOCK

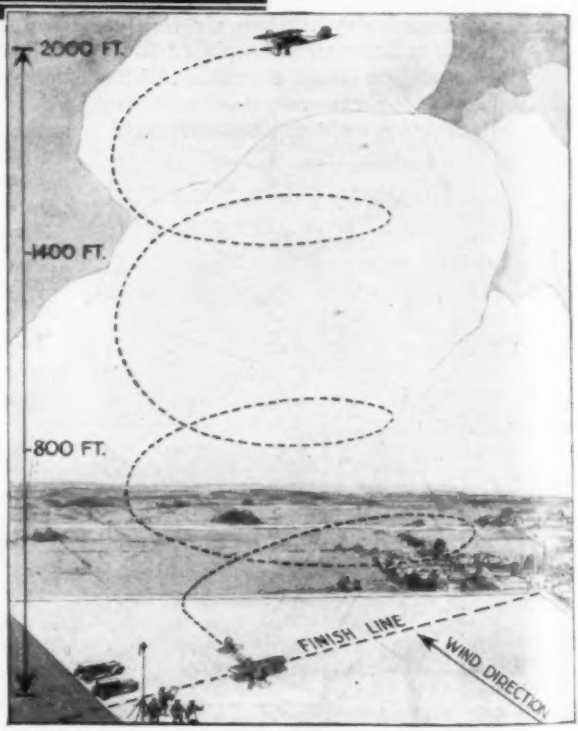
THE DAY after my first solo flight, I appeared at the field, eager for the next lesson.

"Think you can take 'er off alone this afternoon?" Myers asked. I nodded, but he happened to look at the wind cone. "Well, may be I had better go around with you once or twice," he said. "There's hardly any breeze and you may have trouble in knowing where to cut the gun. Remember, you'll glide far on a still day."

Three minutes later, I was glad that Myers was with me. Everything seemed different. It was like learning to fly all over again. I hit the wrong rudder, tried to pull the ship off the ground before it had gained flying speed, and made bumpy landings. The absence of wind completely fooled me.

Myers looked around and grinned. "It's a good thing I didn't let you go alone," he remarked. "I think you'd better call it a day and wait for a time when there's more breeze."

I was crestfallen but realized that my overconfidence, one of the chief faults of the student flyer, had suffered a merited jolt. I faced the obvious fact that one solo doesn't make an aviator, and realized that I needed much more practice on still days as well as



My Wings

"Always Fly with Caution," Inspector Read Counsels Student Pilots

breezy ones before I would acquire the "feel of the ship" and demonstrate that I could fly the plane under varying conditions.

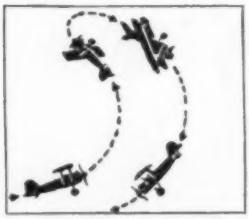
"Cutting patterns" around the field, striving for good landings and take-offs, learning how to "go with the ship" at all times, to turn and bank smoothly and without skidding or slipping—these were the principal objectives during the engrossing flights that followed.

There was a thrill the day the plane was "all mine," that is, when I taxied it off, took off and returned the ship to the line all alone. There was another thrill the day I flew up and over a thin layer of clouds, and an even greater one the day the motor failed on taking off. "Never try to turn around at an altitude of less than 200 feet in an emergency like that," Pilot Myers had told me. His helpful words flashed through my mind after my first impulse to turn. I was nearly at the eastern edge of the field and only about thirty feet off the ground. I quickly put the nose down and landed safely.

Then there was another thrill the day we went up to take photographs. A chartered plane, carrying Jack Atkin, Popular Mechanics Magazine staff photographer, flew alongside at close range. Pilot Myers accompanied me on the first trip and I was allowed to solo on the next. This gave me a taste of formation flying, although my only task was to keep straight ahead and fly as level as possible. To make the photographs and the "formation flight," it was necessary to obtain special permission from the department of commerce, for formation practice is not on the training schedule of the private pilot, and, normally, planes must never fly closer than 300 feet.

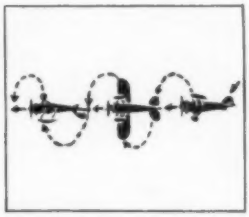
Take-off and landing practice proceeded; then drill began on steep banks, figure eights and spirals.

On a steep bank, you apply stick until one of the inclined cross wires, between the wings in front, lies level on the horizon and at the same time you give rudder to turn the ship. In that position, the plane is banked at an angle of more than fifty degrees, and your task is to keep it into the turn without losing or gaining altitude and without skidding or slipping. Once the ship has started to turn and is properly banked, it is necessary to release rudder on that side and apply a touch of op-



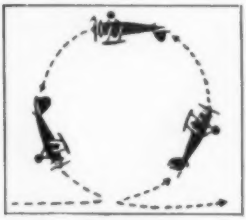
SPLIT "S" TURN

It Starts as a Loop, Then a 180-Degree Turn Is Made While in a Vertical Bank, and the Plane Descends in the Opposite Direction



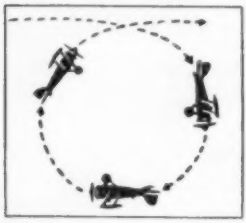
BARREL ROLL

A Favorite Stunt in Military Maneuvers; the Plane Is Made to Execute a Series of Quick Rolls or Revolutions about the Fore-and-Aft Axis



INSIDE LOOP

The Plane Describes a Vertical Circle in the Manner Illustrated, and Is On Its Back at the Top of the Loop for a few Seconds

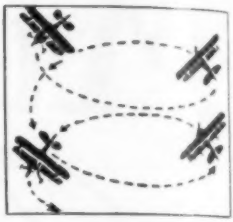


OUTSIDE LOOP

One of the Most Difficult Stunts; the Plane Is on Its Back at the Bottom of the Loop, and the Pilot Is Therefore on the Outside as Shown

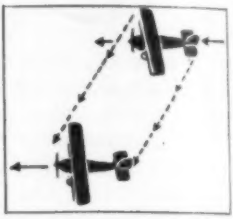
THE SPIRAL

Something like the Coils of a Spring; It Is a Simple Maneuver and a Useful One, but Requires Accurate Judgment and Close Watch of the Altimeter



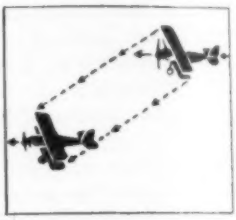
THE SIDE SLIP

One of the Best Ways to Lose Altitude Quickly, as in Emergency Landings on Small Fields; the Plane Slips Sideways Faster than It Travels Forward



THE FORWARD SLIP

The Plane Is Banked Slightly, Not Nosed Down in a Dive or Glide; Sideward and Forward Travel Are About Equal in This Maneuver



THE TAIL SPIN

The Plane Falls, Nose First, as Shown and Spins as It Descends; Private Pilots Are Taught to Execute and Recover from This Maneuver

posite rudder. The plane skims smoothly around at this steep angle, the cross wires sliding parallel with the horizon throughout the entire 360 degrees of the turn. Several complete turns are made at one time before coming out in level flight and then banking and turning the plane to the other side to repeat the process.

Figure eights are exactly what the name implies. You choose two pylons or guide posts, houses, clumps of trees or any convenient marks and proceed to describe the pattern of a figure eight at an altitude of 1,000 feet or so above them. At either end of the eight, you must make the turn into the wind and must not gain or lose altitude. Gentle and steep eights are required for the test. The maneuver is essentially a controlled turn-and-bank procedure over a prescribed course. Smooth, exact flying is one of the essentials. I had some difficulty with rudder. My tendency was to keep left or right rudder on too long, resulting in a slip and a loss of altitude.

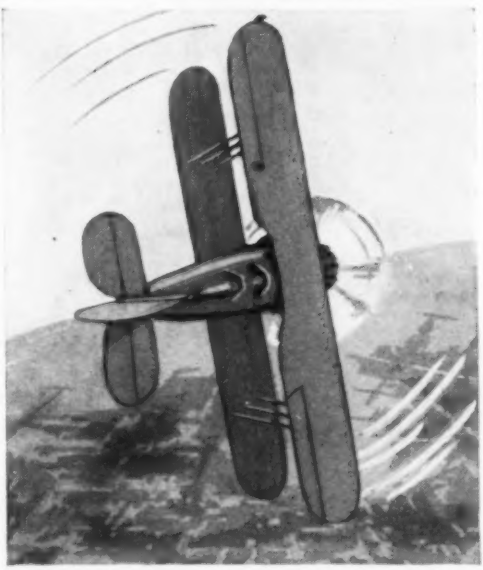
Then came spirals. In this interesting maneuver, you climb to a height of 2,000 feet directly over the landing field, fly into the wind, cut the gun when over the wind cone, and spiral down, making three complete turns on the descent to land into the wind and within at least 500 feet of the finish line without using the gun. Your engine is kept idling, of course, and you are required to clear it from time to time with short bursts of the throttle. This not only prevents the engine from cooling and stopping but reassures the pilot.

To a beginner, the ground looks far below at 2,000 feet. As soon as you cut the gun, there is an impulse to hurry down by gliding too steeply, thereby losing precious altitude unnecessarily. A wind may blow you off your course, requiring constant correction and following the lines of the field and, especially, the line that marks the finish point. On the first turn, you try to lose 600 feet, and the same on the second, leaving 800 feet for the final glide. If necessary, it is permitted to vary the pattern of the last turn, flying outside the borders of the field. Constant watch of the altimeter, the wind cone and the line is essential, and the maneuver calls for accurate judgment. Its value lies in the fact that it gives excellent practice in landing with a "dead stick"—without engine—a feat that may be necessary some day in actual flying.

The day for the department of commerce examination dawned clear and still. Thirteen anxious but eager students awaited Inspector J. E. Read, who climbed out of a big monoplane, bearing the impressive "NS" symbol that denotes a government-owned ship. He carried a portfolio filled with the examination questions, and presently we were writing our answers to the queries that would test our knowledge of fundamentals on license, inspection, flight and other requirements. Careful drill and a final check in ground school had made us familiar with the regulations and we were soon ready for the flight test.

For the flight examination, Inspector Read indicated a finish line, an imaginary mark reaching from his car, parked near

Pilot Instructor Earl Myers Proves That a Cheerful Disposition Is an Asset in Flying



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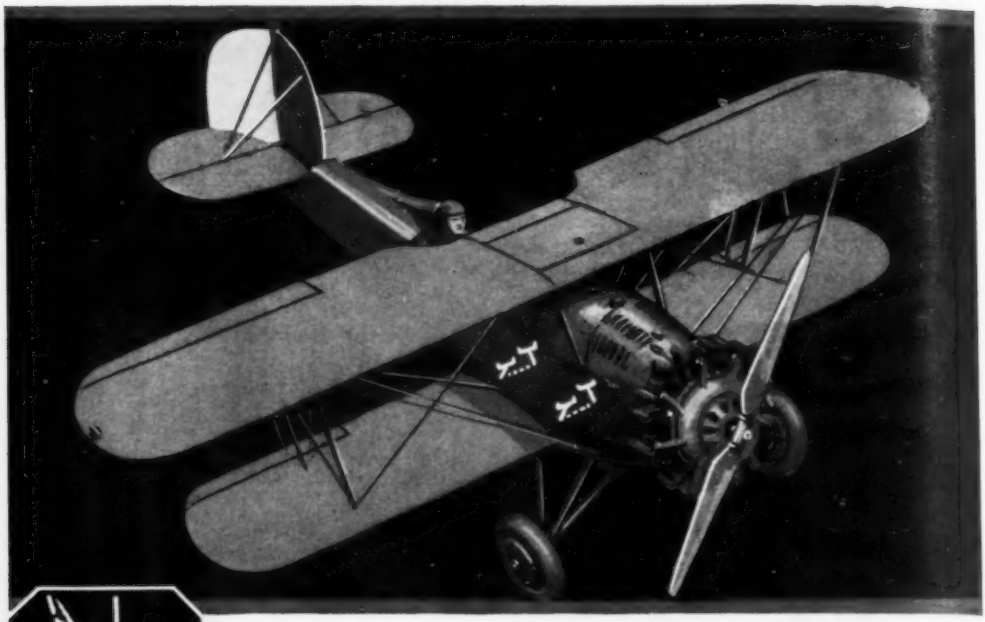
When the Plane Is in a Vertical Bank; Note That the Rudder Functions as an Elevator and the Elevators as a Rudder

the wind cone at one side of the field, to tall chimneys of a brickyard across the road. A sudden change in wind made it necessary to place the line on a diagonal, a fact that caused me some trouble later. Candidates for private pilot's licenses were put through first. The transport and limited commercial candidates, who had already passed the private grades, watched the "rookies" with interest. They had been through the mill and knew what it was like.

"Go up and make two landings after flying around the field," Inspector Read instructed me when my turn came. "Both should be normal landings without undershooting the field and without using gun after the glide. Then do two gentle and three steep figure eights. Those houses over there and that billboard to the north will be your pylons. When you have finished those, climb to 2,000 feet and do your spiral. Make at least two turns around the field. Don't use the gun. Go ahead and make good ones!"

I had done all these maneuvers before, but there was a feeling of nervousness now. I was a bit too far back of the line on the glide in and had to use the gun for an instant on the first landing. The next



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Diagrams of Plane Showing What Happens to the Rudder When Its Pedals Are Pushed; in This Case Right Rudder Is Being Applied

landing was better, and soon I had finished the figure eights and was gliding down from the spiral. Everything went all right until the last turn: then, for some reason I cannot explain, I followed the wrong line on the last turn, using the border of the field instead of the diagonal line Inspector Read had designated. That left me short of the mark so I had to use the engine. In turning, I made too flat an approach and so was ordered to do the entire spiral over again. This one was satisfactory and, with joy, I realized I had passed the flight tests.

My private pilot's license gives me authority to fly licensed aircraft but not to carry passengers or goods for pay. It is effective for one year, unless revoked or suspended for some infringement of the air regulations, and I can renew it at the end of that period by proving satisfactory physical condition and showing a record of at least ten hours' solo flying during the year. The lessons and examinations have opened up for my exploration the world of the sky. They demonstrated to me that, with efficient instruction, reliable planes and normal effort on the part of the pupil, it is not difficult for the average person to learn to fly. There is no mystery about it and nothing to be afraid of, for useless risks are never taken and safety is the first thought of your instructors at all times.

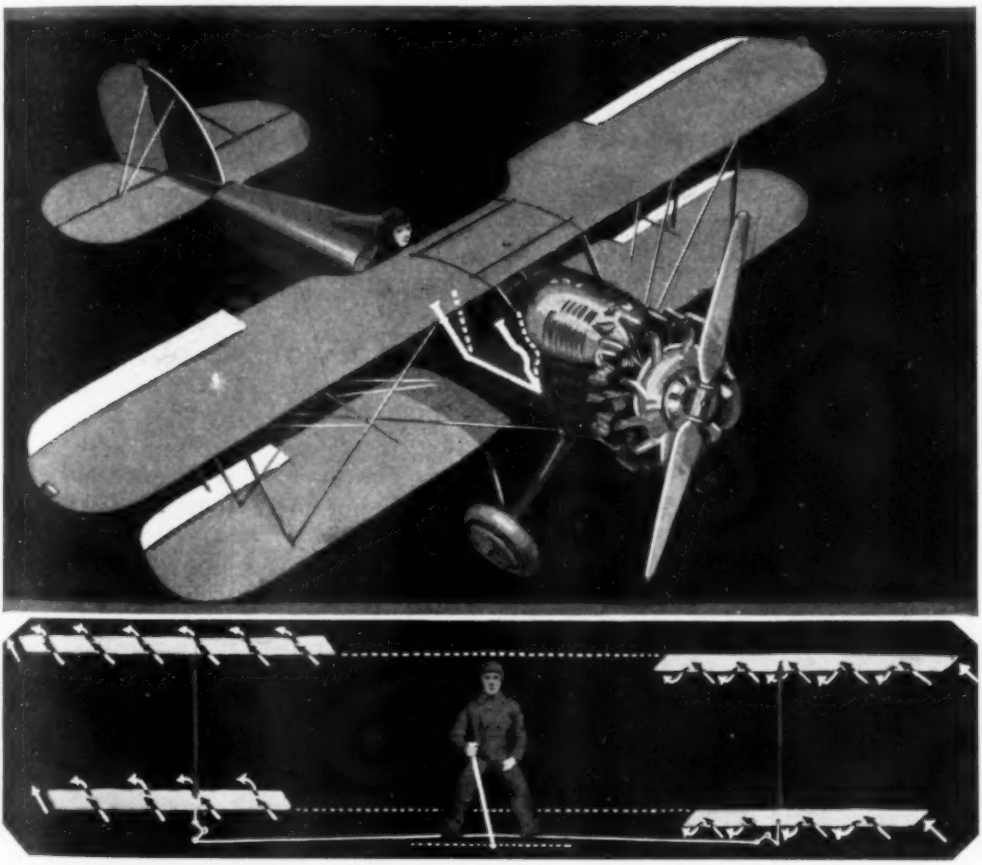
An amazing number of persons are taking up flying. Last year, the department of commerce doctors gave more than 43,000 medical examinations for pilot licenses. This is more than were conducted in all the years combined since the aeronautics branch of the department was organized in 1926. More than 25,000 of the examinations were for persons taking their first tests, and slightly more than 1,400 were disqualified for physical reasons from receiving students' permits. This indicates that the medical requirements are not unjust. The country is dotted with

more than 1,600 airports, and nearly 50,000 miles of air transport routes, many of them lighted for night flying, thread the nation and link it to foreign lands. Ships and engines are receiving constant improvement at the hands of skilled and experienced men. The business has passed the pioneer stage long ago but the skies are far from crowded. There are only a few more than 13,000 licensed pilots in the whole United States with all its millions of inhabitants. Flying is easy! It's an absorbing sport and a profound study. I'm going on with it while the skies are uncrowded and the adventure of it still is keen. A private pilot is only one lowly step up the ladder. I'm aware of the folly of overconfidence, but when an office man of almost no mechanical training, nearly forty years old and of merely normal physical and mental qualifications, can win a private pilot's license, I feel that I have demonstrated, to my own satisfaction at least, that flying, as taught in the best schools, with worthy equipment and teachers of the caliber of my kindly mentor, Myers, is well within the range of the average man's attainment.

(The End)

BALLOONS SUPPLY CITY'S GAS

Housewives in Ravenna, Ohio, recently cooked their Sunday dinners with gas supplied from two 35,000-cubic-feet racing balloons. The big bags were anchored in a field near the gas-regulator plant and were used as temporary storage tanks while a change to new gas mains was being made. The bags were filled with natural gas, and compressors forced the contents into the city lines.



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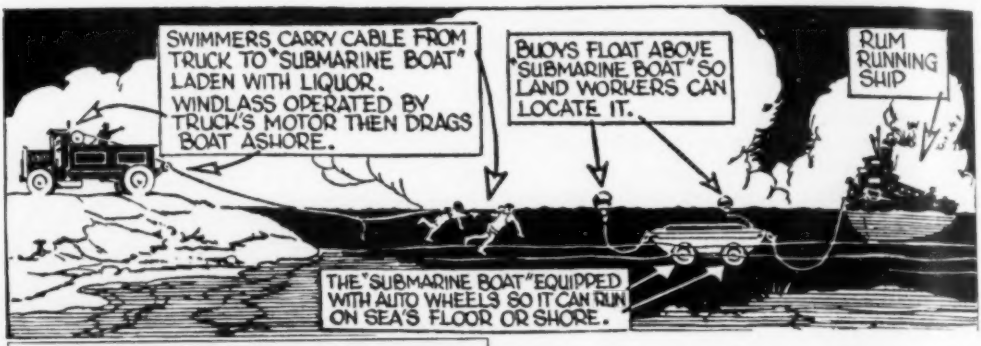
What Happens to the Ailerons When the Stick Is Moved to the Side; in This Case, Movement of the Stick to the Right Is Banking the Plane for a Right Turn

SUBMARINE ON WHEELS IS USED AS RUM RUNNER


SWIMMERS CARRY CABLE FROM TRUCK TO "SUBMARINE BOAT" LADEN WITH LIQUOR. WINDLASS OPERATED BY TRUCK'S MOTOR THEN DRAGS BOAT ASHORE.
BUOYS FLOAT ABOVE "SUBMARINE BOAT" SO LAND WORKERS CAN LOCATE IT.
RUM RUNNING SHIP
THE "SUBMARINE BOAT" EQUIPPED WITH AUTO WHEELS SO IT CAN RUN ON SEA'S FLOOR OR SHORE.

Drawing Showing How "Submarine Boat" on Wheels Lands Liquor, and a Close-Up of Such a Craft

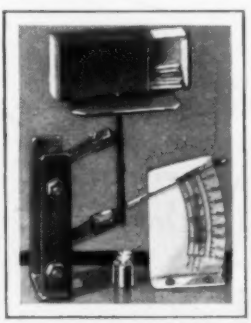
Federal prohibition agents at Santa Monica, Calif., who recently seized a load of liquor on a truck equipped with a cable and windlass, declared the liquor was landed from a ship off the Pacific coast by means of a small "submarine boat," one of which was recently found abandoned on a beach. The submarine craft is simply a small boat or scow which sinks to the bottom when loaded. It is equipped with automobile wheels so it can be pulled over the ocean floor and buoys mark its location for swimmers, who dive to the boat and attach the cable from the truck, the windlass being used to pull the load to shore. The boat then is returned for another load from the rum-running vessel.

WHAT SOUND OF PLANE TELLS SHOWN BY TESTS

If sound waves of a speeding airplane were visible, they would be seen as conical in shape with the point moving forward with the ship and the sides expanding outward behind the plane at about 1,100 feet per second, the velocity of sound. The change in tone heard when a plane passes overhead, or dives and flattens out near by, is explained by a bit of physics known as Doppler's principle. In simple words, when a plane moves away from you, the pitch of the sound is lowered, while the pitch is raised if it is moving toward you. The beating effect heard and often felt results from the ship's rapid motion, being caused by a reinforcing of sound waves already given out, new waves, produced as the plane moves along, joining other waves emitted at a point farther back. The result is a very intense noise, while at other points the sound is reduced because of the cancellation of waves. The noise often appears to come from a point considerably behind the machine because the plane has moved ahead of the point where the noise was produced by the time the sound waves reach the ears.

OLD RAZOR BLADES SERVE AS SPRINGS FOR SCALE

A practical answer to the question, what to do with the old safety-razor blades, has been found by an Ohio man. He uses them for springs in an accurate postal scale. According to the inventor, the steel is of such high quality that it is not readily affected by temperature changes or long usage, and the scales can be manufactured at low cost. Extensive tests have proved that the razor-blade scales are accurate and durable.



ROUGH WEATHER AT SEA HELPS IN SHIPPING FRUIT

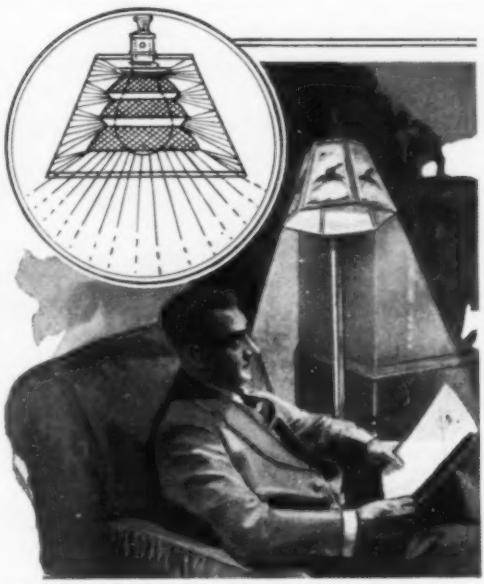
In exporting fresh fruits and vegetables to the far east in a refrigerated vessel from San Francisco, the shippers were surprised at the helpful effects derived from storms. During winds and squalls and the consequent rough seas, it was found that excessive accumulations of carbon dioxide in the storage compartments were reduced, partly because of the entrance of fresh air during the progress of the storm. This helped to maintain a better balance of oxygen and carbon dioxide, which is given off by the fruit and sometimes causes injury if it gathers in too large quantities.

FIFTY-POUND LEG IRONS HOLD VENEZUELAN PRISONERS

Prisons in Venezuela employ leg irons of unusual design to prevent the escape of prisoners. The irons, weighing about fifty pounds, consist of anklets containing two eyes each which are riveted to an iron bar with large ends. The wearer thus is able to maintain either a standing or sitting position, but cannot walk. In order to move, he must crouch and proceed on all fours. The irons came to the attention of United States authorities recently, when an American oil man claimed they were used on him after an altercation with the officials of that country over the custody of his daughter, whose mother was a native girl that he had married.

Fifty-Pound Leg Irons Which Keep Inmates of Venezuelan Prisons from Escaping

© Henry Miller



Reading-Lamp Bulb Equipped with a Reflector Which Creates a Glow Resembling Daylight

ARTIFICIAL DAYLIGHT SUPPLIED BY REFLECTOR FOR LAMP

Fitting over the ordinary electric bulb in a reading lamp, a reflector has been made which diffuses and breaks up the light through a system of blue-glass mirrors, thus making an artificial daylight for reading purposes. The reflector is so designed that unfiltered light passes through to illuminate the shade, while at the same time it throws downward a soft white light which does not strain the eyes in reading. It fits snugly over the bulb and cannot be seen if a shade is used with the light.

U. S. AIR MAIL LEADS WORLD

Comparison of air transportation in the United States and Europe shows European lines devoted almost exclusively to carrying passengers while the American lines are far in the lead in transporting mail, express and freight. More than 5,000,000 pounds of mail are carried annually by planes in the postal service in this country, such ships flying a total of more than 10,000,000 miles.

¶Women's hair is neither silkier nor softer than men's, scientific investigations have revealed.

During a Demonstration of the Combine Corn Harvester, a Modern Unit That Saves Husking by Hand; It Is Pulled by Tractor

HARVESTER CUTS CORN, SHELLS CLEANS AND BINS IT

One of the latest units in time and labor-saving farm machinery is a combine corn harvester that not only cuts the crop but shells, cleans and bins it and cuts the stalks so that they may more easily be plowed under. Three men only are required to operate the entire outfit, two on the combine and a third to haul the shelled corn away from the bin on the machine. The harvester cuts two rows of stalks at a swath and will gather from fifteen acres upward per day, depending on conditions. It travels from two to three miles an hour and any medium-size tractor will pull it. The unit is so designed that it may be attached to a wheat combine, or the corn combine may be converted into a wheat harvester by purchasing the wheat attachment, thus providing in one machine and attachment an outfit that will harvest practically any crop that can be handled by this method.

"DOLDRUMS" OF THE AIR CAUSE DISASTROUS HURRICANES

Like the human mind, the atmosphere is subject to the "doldrums" when there is a state of depression. Such a condition of unstability is responsible for the West Indian hurricanes, Charles L. Mitchell, of the weather bureau, declares. There is an area called the doldrums over the Atlantic ocean north of the equator, between South America and Africa. This moves north and south with the sun and in this belt there is a slight depression of the barometer. When the belt of doldrums is near the equator, winds are light and variable and there are local thunderstorms, because the force of the earth's rotation, which is necessary in initiating a cyclonic storm, is near zero near the equator. However, in late summer and early autumn, when the doldrum's belt is away from the equator by several degrees, the deflective force of the earth's rotation is quite sufficient to initiate a cyclonic circulation, if other conditions are favorable.

SPEEDOMETER ON REAR OF CAR AIDS OTHER DRIVERS

To advertise his business and at the same time to help other autoists, an automobile accessory dealer has devised a huge speedometer which he has attached to the rear of his car. The instrument accurately records the speed of the automobile and thus enables other drivers to gauge their own speed and check their instruments.

This Large Speedometer on Rear of Auto Enables Other Drivers to Check Their Speed and Instruments

Millions for Plant Inventors

Here Plant Breeders Are Shown Studying New Kinds of Sugar Cane in Efforts to Produce Improved Varieties; This Plant Offers a Great Opportunity to the Plant Breeder

WHO ever heard of a single tree twig being worth a cool million? Sounds fishy, doesn't it? Yet the situation will be entirely possible under the terms of a new bill just passed by congress that ought to line with gold the pockets of future Burbanks.

Briefly, here's what your Uncle Samuel has just announced: The genius, whose patience, foresight and effort can give to the world an entirely new variety of fruit or other plant, shall henceforth be rewarded in very much the same way as is the inventor of a new mechanical device. He will have precisely the same legal rights, and if his product is world-wide in importance and he's a good business man, he can clean up by leasing out his invention on a royalty basis.

Of course, there's a catch in this; in fact, several of them. In the first place, the new law specifically states that the discovery, in order to merit a patent, must be reproduced by means of cuttings, buds, or methods other than by seeds or tubers. This, of course, excludes potatoes, which are tubers, and wheat, corn, rye, oats, and the like.

Now the reason given for this negative clause in the new law, as pointed out by plant and patent experts, is that these plants are such standard products that to grant the right to use any new varieties of them exclusively might so monopolize the market that skyrocket prices would prevail.

But let's get right down to where and how a plant wizard can reap huge rewards. It is interesting to note that the framers of the new bill originally thought of limiting the life of a patent for a new plant to five years. Fortunately for the plant inventor, the experts realized that this would be a woeful mistake. For it is quite obvious that, after a patent has been granted, it might easily take five years or more before the new plant could be placed on the market profitably.

A point that makes the new law particularly promising for the first-rate plant

Blackberries for Sale: a Large Berry That Will Withstand Long-Distance Shipment Is Sought

inventor lies in the fact that most of the fruits that can be grown in the United States can be propagated by cuttings. Strawberries, blueberries, raspberries, and nearly all types of apples are included.

No less an authority than Mr. W. A. Kinnan, first assistant commissioner of patents, gives voice to the startling statement, mentioned earlier, that under the new law a single twig might well be worth a million or more. However, let's suppose that a plant breeder has developed such a twig for producing a new fruit. Certainly, warns Mr. Kinnan, the developer had better not give it away unconditionally, for in such case the man who gets the gift would possess all rights to the million-dollar twig which originally were held by the breeder.

Or, suppose the inventor had developed his new type of fruit tree to the point where it bore fruit and then sold a single cutting from the tree. Here, too, he would part with control of his invention if he were to sell that cutting unconditionally.

The only way to block any move of this sort, Mr. Kinnan explains, is for the inventor, during each sale, to make sure that his rights are reserved. In other words, a contract should be drawn up whenever a sale of a new plant is made, stating definitely exactly what rights to the plant the purchaser has bought. The buyer may be allowed to grow only the one plant sold to him, or, perhaps, he may be permitted to raise, for his own use, an unlimited number of plants bred from the original one.

Of course, flowers, as well as fruits, are included in the new law, and it is an interesting fact that most of our popular flowers are propagated from bulbs or cuttings. Among these are tulips, roses, dahlias, chrysanthemums, gladiolas, daffodils and crocuses.

Some idea of the great value of

Treating Insect-Infested Ornamental Tree; There Is Big Money in a Tree Impervious to Disease

plant patents to the inventor may be gained from the work of A. D. Shamel, veteran plant breeder for the department of agriculture. During the past twenty-five years he has specialized in citrus fruits, and, largely by virtue of his individual efforts, the industry in California has been virtually revolutionized.

Then there is the case of the new variety of tomato, known as the "marglobe," which was developed by expert plant breeders of the department of agriculture. It is particularly resistant to devastating diseases. Government experts point out that this one type of tomato has resulted in a saving of over $1,000,000 annually in one county in Florida.

One thing, at least, is certain about the new bill. It has a far-reaching national, and even international, importance.

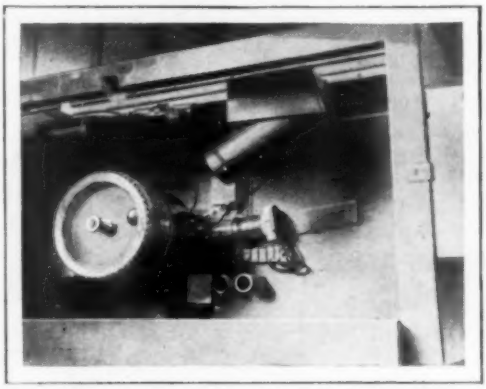
Auto Tire, Weighing Two Tons, Undergoing Road Tests

AUTO TIRE TWELVE FEET HIGH WEIGHS TWO TONS

One of the large rubber companies has made an auto tire twelve feet tall, with a width of four feet and weighing approximately two tons on its wheel and axle. This huge tire, possibly a sample of what the vehicles of the future will wear, is being tested by pulling it over the country in an axle frame attached to the rear of an automobile.

TELEVISION CLEAR AS A MOVIE SENT BY NEW TRANSMITTER

Germany recently tested a television transmitter which has been found to send pictures that spectators are able to observe much as though they were watching a moving-picture show, the images being as clear as those seen in the average movie. The transmitter catches pictures with a sharp lens having celerity of 50,000 light points a second. These light points are changed by a photo-electric cell into electric impulses and transmitted on a seventy-meter wave. In the tests spectators thirty miles distant sat in front of a lens and observed pictures of the actors just as they might in a movie.



Receiving Apparatus for German Television Transmitter Which Gives Exceptionally Clear Pictures

COTTON CLOTH AS STATIONERY SUBSTITUTE FOR PAPER

Writing "paper" that weighs no more than ordinary stationery and provides a good surface for clear print has appeared in the form of cotton fabric. A southern manufacturer introduced the material to illustrate just one more of the many uses to which cotton may be applied. His concern is also using cotton cloths for signs and it is predicted that cotton rugs and draperies will be available.

Phone Cable Inflated with Gas, and Gauge to Detect Leaks

LEAK IN PHONE CABLES SHOWN BY INFLATING WITH GAS

Ordinary illuminating gas is used to detect leaks in the $10,000,000 underground telephone cable between San Francisco and Los Angeles. The gas is pumped into the cable, and should a leak develop which might allow water to enter and short circuit over 500 wires, the decreasing pressure of the escaping gas automatically registers on a gauge at the station nearest the leak, and at the same time sounds an alarm. A repairman thus can be dispatched immediately to locate the leak and make repairs before serious damage occurs.

¶A rapidly growing list of persons both deaf and blind reveals 715 with this double handicap in Canada and the United States thus far.

BIRDS FLY FASTER THAN AIRPLANES RACES SHOW

Races between airplanes and trained racing pigeons are popular in England and thus far the pigeons seem to have the edge. The birds might win almost invariably except that, when liberated, they usually spend a time circling until sure of directions, the planes often gaining a start of some fifty miles in this way. Swallows, jackdaws and starlings all are noted for their speed and quite often these birds have been seen to outstrip a fast plane. Vultures, with a wing span of over six feet, dive straight down at an estimated speed of 400 miles per hour. Hawks and other birds of prey have slender wings and bullet-shaped bodies, thus giving a streamlined effect which makes them faster than other birds.

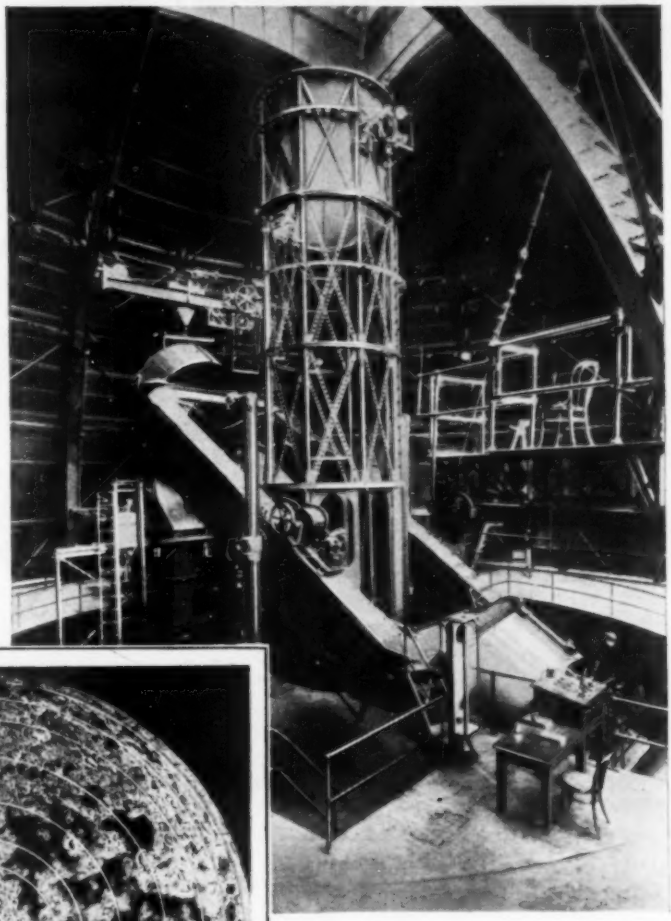
AIRPLANE IN A SLOT MACHINE TEACHES FLYING

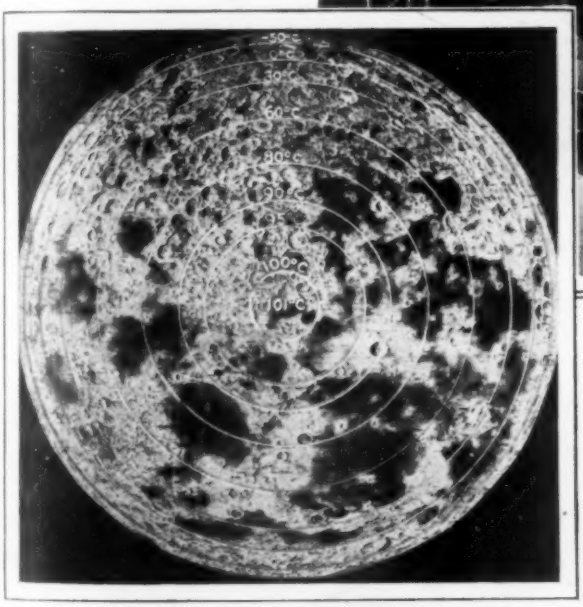
Some of the thrills of handling an airplane in flight are offered by a slot machine containing a small airplane. When a coin is inserted by a patron, a motor is started which supplies a wind velocity of about thirty miles an hour, causing the plane to rise in its glass cage. The control stick extends outside the cage and is manipulated by the operator to control the movement of the ship in the air. The apparatus is being employed by a number of flying schools to demonstrate some of the first principles of aerodynamics.

Slot Machine Containing a Plane Which Rises in an Air Blast and Is Controlled by Operator

MEASURING TEMPERATURE OF STARS AND PLANETS

Taking the temperature of the stars and planets is the purpose of a planetary thermometer, known as a thermocouple, which is mounted on the 100-inch telescope at Mount Wilson observatory. With this instrument for measuring heat radiated by stars, scientists have found that the surface temperatures range from 41,000 degrees Fahrenheit for the very blue ones to 10,000 degrees for those of the class to which the sun belongs, and on down to 2,800 degrees for the very red, long period, variable stars. With the instrument it was learned, for instance, that



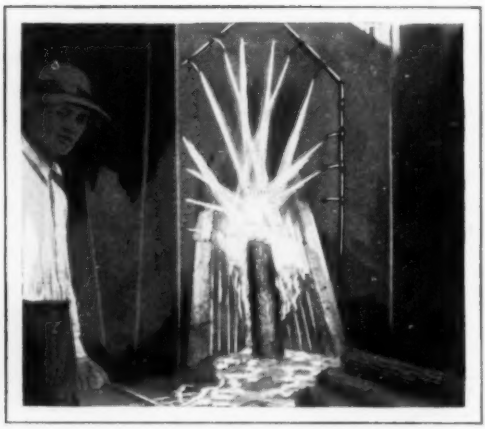


Above, **Instrument for Taking Temperature of Stars Mounted on Observatory Telescope; Below, Heat Chart of Moon**

temperatures on the moon are subject to enormous changes, due to the lack of atmosphere. From observations with the instrument, it is possible to prepare heat charts of the different stars and planets, showing what are believed to be accurate estimates of the temperature of various regions.

BLACK ANTS ARE GOOD FIRE FIGHTERS

Black ants are expert fire fighters in the opinion of a forest ranger who has made a study of their tactics. A lighted match tossed near an ant hill was attacked by an army of fifty ants, moving toward the blaze in platoons, kicking and biting at the fire. When a lighted cigaret was tossed near by, a larger force of the insects hastened to this new peril and extinguished it.



Not a Pyrotechnics Display, but a Log Washer Shooting Water under Pressure on the Timber

WASHER CLEANS LOGS ON WAY TO THE SAWS

One sawmill near Seattle employs a mechanical log washer to clean timber on the way to the saws. A dozen powerful streams of water under high pressure are played on the logs as they pass up the chute to the mill, thus washing off all sand, dirt and loose bark to protect the saws and keep sand out of the sawdust, which is used in sawdust burners in Seattle residences. The log shower, in operation, gives an impression of a violent pyrotechnics display when viewed in pictures. It can wash 400 logs a day.

WOOD MILLIONS OF YEARS OLD FOUND TO BE SEQUOIA

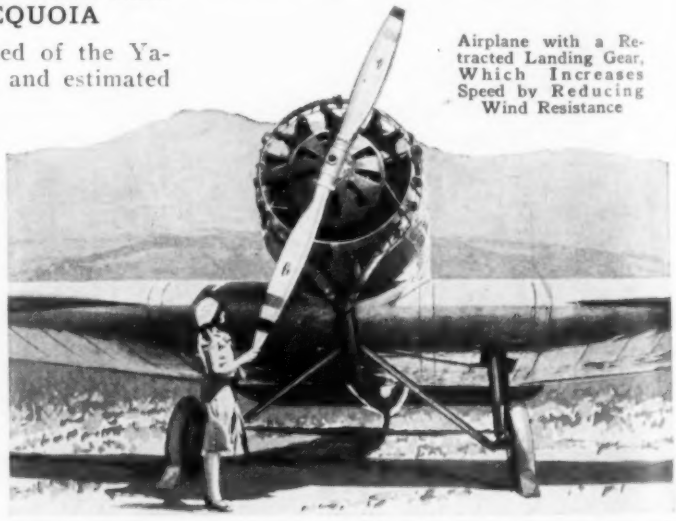
Discovered below the bed of the Yakima river in Washington and estimated to be at least 12,000,000 years old, a fragment of wood has been identified as a variety of Sequoia or the redwood which grows in California today. Arthur Koehler, identification expert of the Forest Products laboratory, examined the specimen under a hand lens. It was too soft to be sliced for microscopic inspection but Mr. Koehler was positive in his analysis. The piece was found in solid basalt that is believed to have been poured forth by volcanos many centuries ago. Sequoias flourished in many parts of the United States, Canada, Alaska and Greenland in ancient times, according to Mr. Koehler, and fossil cones of the trees were found in rocks and swamp deposits in certain parts of Europe. The ancient wood sample was taken from a log found when a tunnel was being driven under the river.

BLACKBOARDS MADE OF GLASS

Blackboards have been made of glass after many experiments. In making the glass about twenty-five per cent of black chromite, a mineral consisting of oxides of iron and chromium, is added to the raw materials. This makes a glass that is able to withstand rubbing. Ordinary glass does not do so, because it wears smooth in time. Artificial rubbing tests, equivalent to 125 years of use, produced no appreciable change in the writing surface.

SPEED OF AIRPLANE INCREASED BY RETRACTED GEAR

By means of a retracted landing gear, a low-wing all-metal monoplane, recently constructed, has been able to increase its speed twenty miles an hour. This is possible because of the reduced air resistance. The ship, equipped with a 575-horsepower motor, can carry a ton of pay load at a cruising speed of 140 miles an hour.



Airplane with a Retracted Landing Gear, Which Increases Speed by Reducing Wind Resistance

QUEER AND CURIOUS FACTS ABOUT WILD ANIMALS

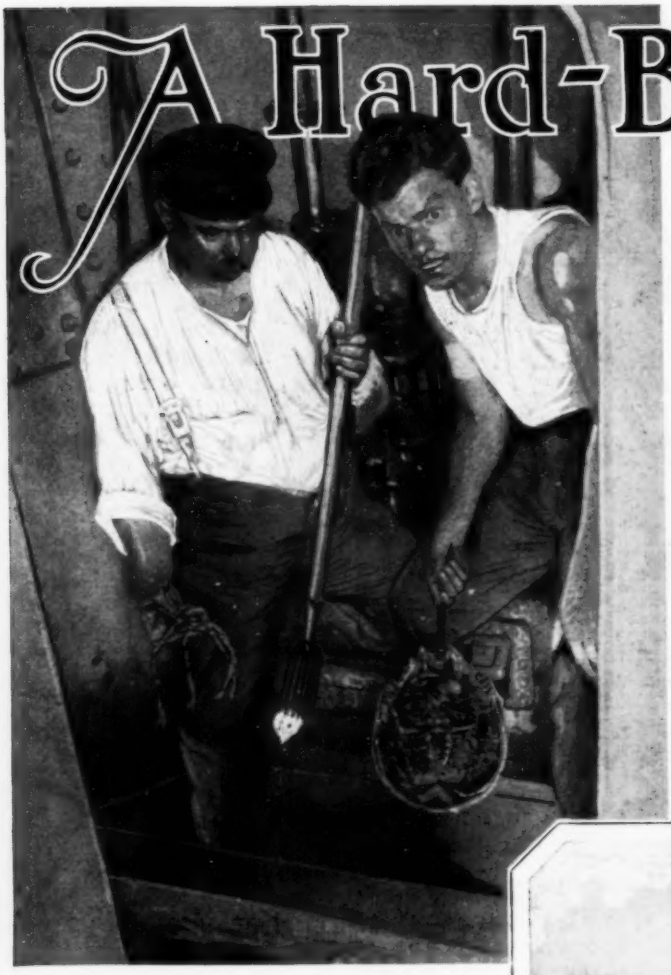
Did you know that bears are left-handed? A wild bear practically always throws its weight on the right paw and works with its left. A mother bear coaxes her cubs into a pool where she scrubs and scours them in spite of all the usual objections of the small child. She gives special attention to the eyes and ears. All bears are afraid of skunks and this includes grizzlies; they also avoid porcupines. A cougar will kill 100 deer or elk annually. Occasionally coyotes caught in traps show no fear of the approaching trapper, but actually wag their tails and whine like a dog. Wild animals are not so sure-footed as many persons believe. Even the mountain goat takes an occasional tumble. Elk and moose have been known to slip and fall to their death. Snakes lay eggs; so do alligators, turtles and fish. These eggs are all of the soft-shelled variety and are hatched by the heat of the sun. In the cattle country and in the bad lands, rattlesnakes live in dens of hundreds. Cowboys hunt them out and with dynamite kill them "en masse." This is a protection to their stock. Rattlers usually travel in pairs and cannot be depended on to give warning; sometimes they strike first. A bald eagle is not bald until it is two years old, and even then it is not bald but its head is covered with white feathers. The "harpy," tufted or crested eagle, is the rarest and most terrible of our eagles. It can outfly and kill in the air any living thing. It kills by striking a blow with its feet doubled up like fists. The horned owl is the only living thing that will deliberately hunt for skunks and civet, kill and eat them. Eagles and hawks eat snakes; so do bears and opossum. The chimney swift will keep on the wing from dawn to dark without alighting. Chickadees and nuthatches feed in an inverted position, a squirrel can run down a tree upside down and a bear comes down backward.

Top, a Bear Coming down a Tree Backward Like a Man Would Descend; Left, Salmon Trained to Jump through a Hoop; Right, the Bald Eagle, Which Is Not Bald at All as Its Name Implies

LACE DESIGNS FROM CAST IRON

Cast iron in lacelike designs is one of the curious and prized possessions of the Franklin Institute in Philadelphia. A box, from which the bottom had been removed, was placed on the sand of the foundry floor and filled with pieces of charcoal, loosely thrown in. It then was filled with molten iron which ran down between the pieces of charcoal, the latter finally burning out and leaving the lacelike Japanese patterns.

A Hard-Boiled



By JOHN F. COGGSWELL

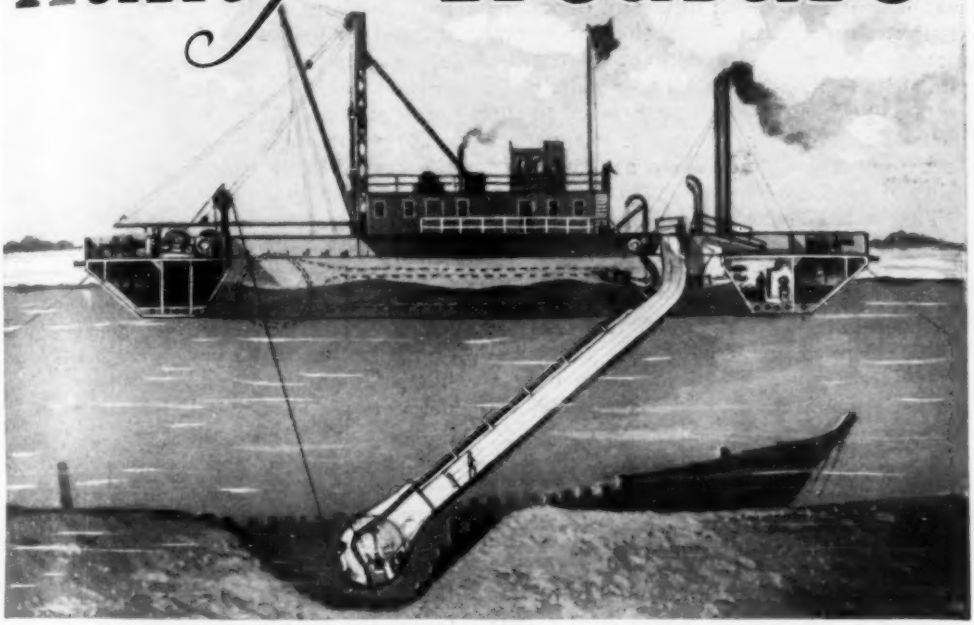
THE WORLD'S greatest hunt for sunken treasure is scheduled to begin during the summer of 1931. Its leader says that it is bound to be successful. For this will be no ill-organized excursion of adventurers to desert isles, where the more or less mythical treasures of the pirate kings are supposed to be buried. It will be a commercial proposition, headed by hard-boiled businessmen, mechanically as near perfect as possible, well financed, and designed, not for a sudden flood of fortune, but to return a profit on the investment.

However, it will not be lacking in adventure and thrills. To Simon Lake—the man who invented the level-keel submarine and made it a workable machine of war, the man who leaves submerged submarines and walks the ocean's floor as we walk in our gardens, floats to the surface along a buoyed line, if he so desires, and descends again and enters the craft waiting for him far beneath the surface; the man who has always demonstrated his inventions personally, no matter what the seeming risk—to this man the venture spells romance and the culmination of long years of experimentation.

His eyes brighten and the words pour forth as he tells of the ancient flagship of the Spanish Armada, treasure-laden, sunk in the sixteenth cen-

Fishing on Bottom of Long Island Sound, and Front View of Special Submarine under Construction

Hunt for Treasure



Sketch of Cargo-Recovery Ship to Be Used in Treasure Hunt, Showing Submarine Tube with Chamber at Lower End; Tube Is Drawn Up Out of Way When Not in Use

tury in the Bay of Tobermory, close by the estates of the Duke of Argyll, in Scotland. Recoverable? Certainly. Crude drag-bucket efforts have already brought up a few "pieces of eight" from the rotted hulk. Modern methods would make the salvage of her treasure fairly simple.

His belief is well founded on experience, for he is no amateur submarine treasure hunter. But the bigger wrecks must wait until he has added to that experience by bringing lesser fortunes to the surface. Already he has done just this with twenty cargoes. And many more await him. In fact, the floor of the ocean is literally carpeted with wrecks.

Simon Lake ponders with longing over the wrecks of the great treasure ships. They stir his imagination to the depths and his love of the romantic. His associates know that he will never be happy until he has had a go at one of these big fortunes. But his present plans have nothing at all to do with them. He has proved his ability to recover cargoes of lesser value at a cost that nets a certain and secure profit. Everything he expects to do in a big way in the big venture, he has already done in a small way.

The coal alone on the bottom of Long Island sound, in the aggregate makes up a treasure of no mean dimensions; it is worth more than $2,000,000. Nearly twenty years ago, the submarine man started evolving the best means of recovering coal from the bottom of the ocean. Nothing could be more romantic than the success of his first venture.

He constructed a cargo submarine without machinery; it was simply a steel shell with flood valves and hatches. In his private submarine, the "Defender," he went to the bottom beside the hulk of a sunken coal barge. He donned a diving suit and stepped out of the escape hatch onto the bottom of the sound. Over a telephone, he directed the submerging of the cargo submarine.

With it in place beside the coal barge, he climbed to the deck of the "Defender,"

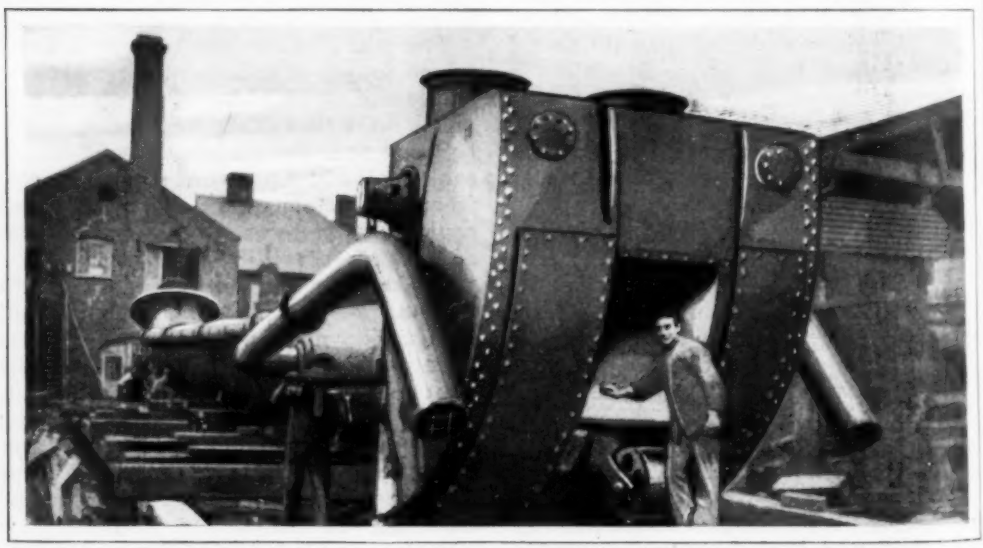
upon which was mounted a six-inch centrifugal pump. The intake tube was buried in the coal and the discharge pipe was placed in the hatch of the cargo boat. In exactly nine minutes, fifteen tons of coal was pumped from the hulk and deposited in the cargo craft. Then the hatch was clamped down and air was pumped from the surface into the carrier, expelling the water. In a few minutes, it bobbed to the surface and the first valuable cargo ever recovered by submarine was towed in triumph to the home dock.

That was a real thrill for the submarine treasure hunter. He finished salvaging the cargo of coal and then set out looking for other sunken wealth. And he found and recovered it. Understand, though, that salvage work during the years between that day and this has been only a slack-time job for Simon Lake. He has had to put in most of his time designing and building naval submarines.

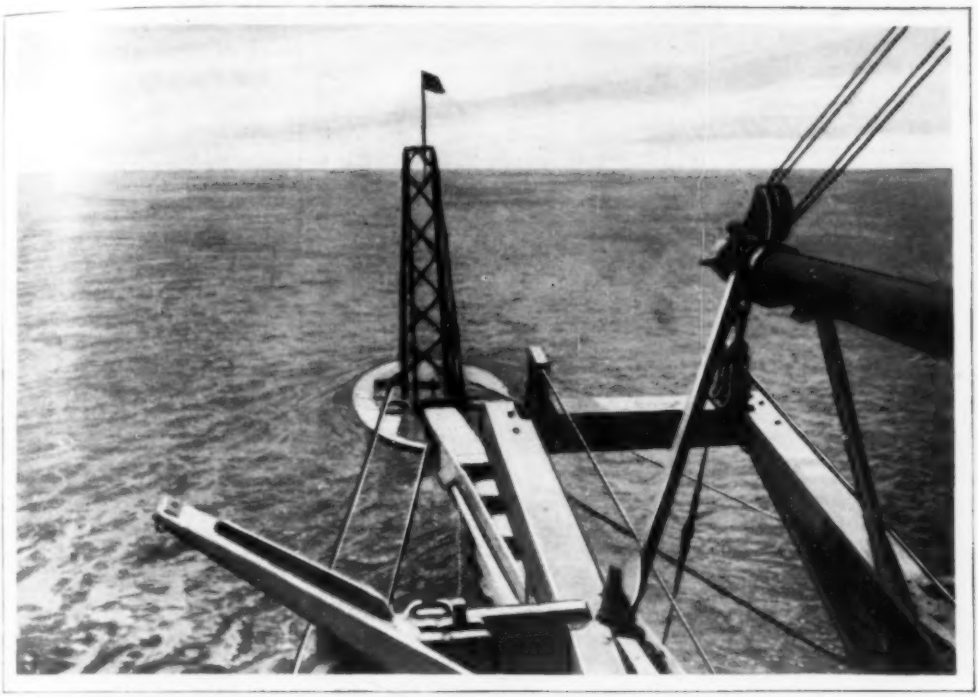
But whenever he had a chance, he was out with the "Defender" seeking long-lost treasure. There's no other thrill in the world, he claims, that equals that of discovering and exploring a sunken ship. It soon became his hobby, and a most profitable one it turned out to be, even though comparativey little time was spent at it. More than a score of sunken vessels—some of them on the bottom long beyond the memory of living men—he has located and salvaged the cargoes of many of them. Some of the recovered wealth went into the little cargo submersible; more was recovered with his later apparatus, the submarine tube, by use of which a man, without diving suit and under only normal air pressure, may carry on salvage operations 200 feet and more below the surface of the sea. It is this newest apparatus that will be used in the big operations planned for next year, now that the partial outlawing of the submarine in warfare has given the veteran submarine builder an opportunity to make come true his dreams of wresting long-lost wealth from the bottom of the sea.

Cargoes long covered by the sea waters are interesting. There was the cargo of one ship that had been sunk so long that her sides and deck had completely disappeared. But left standing on the ocean's floor was a huge pile of kegs. Brought to the surface, they were found to contain old-fashioned cut nails. The outer portions of the contents of the kegs had been transformed into solid iron oxide, but when this was broken apart, the nails on the inside were found to be in perfect condition and as strong as the day they were made.

Another ship, sunk during Civil War days, carried a deck load of pistols, rifles and mule shoes. The entire deck cargo had rusted together into one solid mass.



One of the First Submarine Tubes Constructed by Simon Lake; It Was Designed for Salvaging Treasure from the "Lutine," but the War Prevented Its Use



Submarine Tube and Chamber for Use in Depths of Fifty Feet and Less; the Tower with Flagstaff Warns Surface Craft and Protects Submerged Tube

This was blasted into chunks and brought to the surface by an electromagnet, directed from the salvage tube, and sold for scrap iron.

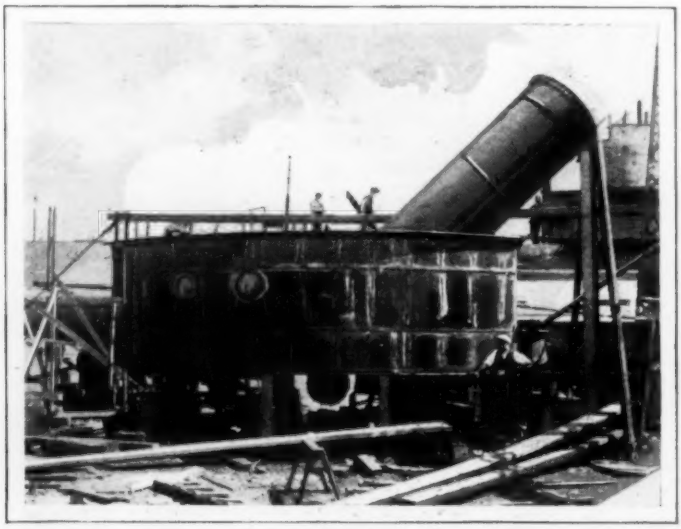
These are the sort of cargoes—not piece of eight, gold bars and silver bullion—that will engage the attention of the twentieth-century treasure hunters. Hunting wrecks, according to Mr. Lake, is just as fascinating and exciting as hunting big game or prospecting for precious metals. There's always the lure of a big find just ahead.

Three surface vessels of the trawler type are used in the operation. Two of the vessels steam in parallel courses about a mile apart with a sweep line dragging over the bottom of the seas between them. As a certain area is covered, it is plotted on the chart. The third vessel carries a so-called "electric crab," another Lake invention, attached to the sweep line in such a manner that it can be caused to traverse the line in either direction. The vessels steam ahead at about two miles per hour.

When the sweep line encounters a wreck or other projection from the ocean's bed and is stopped, an automatic device on each ship pays out the line so that it will not be parted by the strain. The boats are anchored, and the electric crab is sent along the bight of the sweep line. It hauls itself along automatically until it is stopped by the obstruction, which is immediately shown by the drop of an indicator aboard the ship.

Down the line connecting the crab with the ship, goes another automatic device which indicates whether the obstruction is wood or steel or neither. Of course, if the obstruction is a sunken ship, it is constructed of one of these materials. If the indications are that it is a ship, a diver is sent over to see if the cargo is of sufficient value to pay for salvaging, in which case he buoys the wreck and comes to the surface.

Simon Lake's submarine tube for use in recovering cargoes is rather a simple device. It consists of a long, telescopic tube, of sufficient diameter to allow easy passage of a man's body. One end of the tube is swiveled to the cargo-recovery vessel, so that it can be lowered or raised at will. Through it, the wreckers literally



Side View of Submarine Chamber under Construction; It Is Lighter by Electricity and Has Telephones to Quarters on Ship

walk downstairs to the bottom of the sea. By telescoping, the tube can be varied in length from fifty feet to 200 feet and more. On the end designed for submergence to the bottom, there is a large chamber, fitted with water tanks like a submarine, by flooding or emptying which the chamber and tube are caused to sink to the bottom or rise to the surface.

The operator, descending through the tube enters the operating room of the chamber. Aquascopes allow him to survey the outside surroundings. In dark waters, he can switch on powerful lights to aid his vision. The room is fitted with apparatus for directing the change of position of the tube and for handling, starting and stopping pumps, derricks and grab buckets. Besides the operating room, the submarine chamber contains a compression room and an air lock, from which a diver may leave the chamber for the bottom of the sea or the deck of a wreck, through a trapdoor.

An experimental tube, but sixty-seven feet in length, has been handled successfully from a small surface craft of houseboat appearance. However, the longer tube and larger chamber require a stanch, strong vessel for their surface anchorage. This craft, upon which construction has been started, will have a length of 150 feet and a beam of thirty feet. In appearance it will resemble somewhat an ordinary large suction dredge. It will be large enough to handle a submarine tube capable of extension to 300 feet.

In use, the vessel is moored above the wreck to be salvaged. Traversing the tube, the operator takes his place in the machinery room. The tanks are flooded and the chamber submerged to within a few feet of the upper deck of the sunken ship, in a position close to a hatchway.

Suppose it is a cargo of coal. The operator directs the end of a suction pipe to a position just above the cargo. The pump on the mother vessel is started, and the coal, with water, is swiftly drawn up and discharged over a screen, which drains off the sea water, into a barge moored alongside. As much as 150 tons of coal per hour has been recovered by this method. A new pump will bring this capacity up to 300 tons per hour. There's treasure for you—many thousand dollars worth in a day's pumping.

For other cargoes, the operator has facilities to direct grabs, buckets or magnets into proper position to pick up the load. Remember that he does all this from a dry chamber at ordinary air pressure. However, there are cargoes such as machinery, glassware and goods in large boxes that cannot be handed by these means.

In such a case, a diver steps into the compression chamber and dons his diving suit while the pressure is run up to that of a corresponding depth of water. Then he enters the air lock and from it steps out onto the deck of the wreck and into position to sling the cargo to be taken to the surface.

¶Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished free upon application to our Bureau of Information.

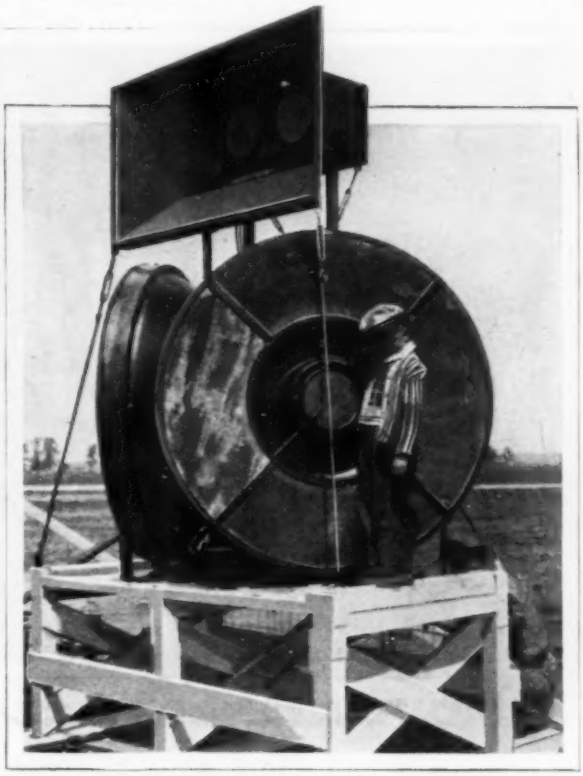
HOW ORVILLE WRIGHT USED RAKE FOR ALTIMETER

When the first great aviation meet was held in this country in 1910, Orville Wright checked the altitude of his flyers with a garden rake, which therefore became the first altimeter. The inventor walked about the field holding the tip end of the handle against his cheek. Sighting along the handle, he measured off, with three teeth, four teeth, or more as the case happened to be, the wing spread of the biplanes. Then, upon consulting a calibration chart, he computed the height at which the ships were flying.

LIGHT FOR EXAMINATION OF CHECKS DETECTS FORGERIES

Banks in Germany are making use of an electrically operated "light box" to detect forged checks and counterfeit notes. Currency or checks, placed over an aperture in the top, are examined through an eyepiece, revealing watermarks and all other identifying details. Textiles also can be examined.

Electrically Operated "Light Box" Employed by German Banks to Detect Counterfeit Notes



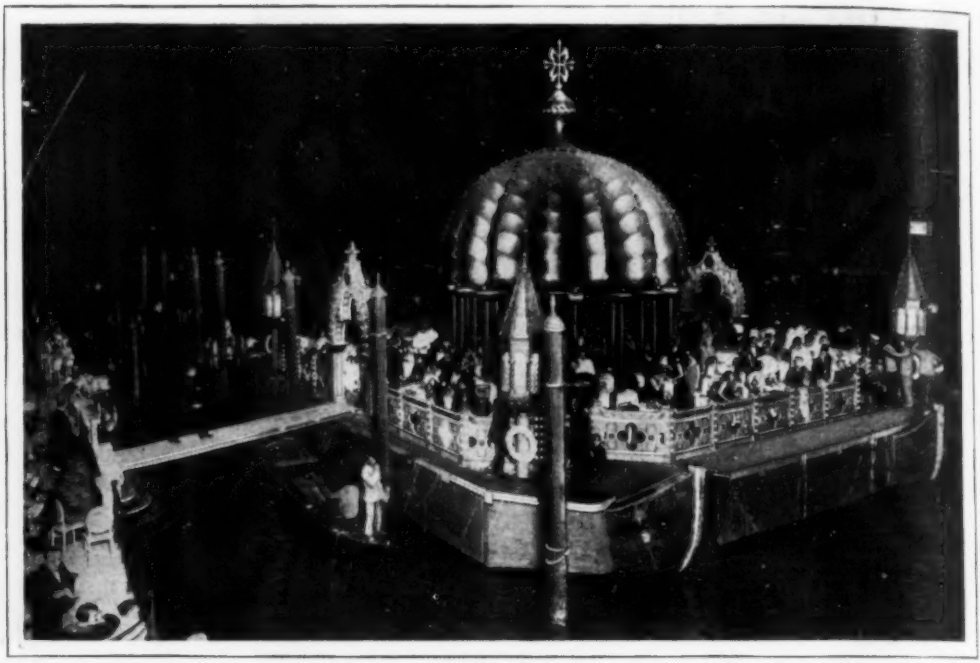
One of the Eight Big Loud-Speaker Units That Enabled Crowds Attending National Air Races to Follow the Events

GIANT LOUD SPEAKERS REPORT AIR-RACE RESULTS

Eight giant loud-speaker units enabled crowds attending the national air races at Chicago to hear the details of the events they witnessed. The units were fed by a central amplifier atop a hangar from which an announcer described the events. Each unit contained four speakers, which spread the voice to the sides, while two speakers on top threw it in front.

RANGE OF VISION WIDENS FAST AT HIGH ALTITUDES

Standing on the earth's surface at tide level, a person has a visual range of about three miles unless the presence of mountains or other masses permits a farther view, according to W. L. G. Joerg, of the American Geographical society. The range of visibility increases greatly, however, with increased altitude. At 1,500 feet it is about fifty miles, and at 10,000 feet approximately 132 miles.

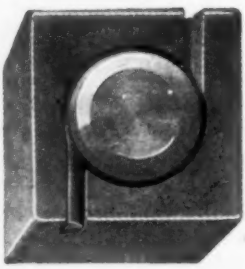


Floating Night Club in Venice; It Is a Barge, Gaily Decorated and Illuminated, and Contains a Dance Floor, Tables about the Edges for Refreshments and an Orchestra Platform

FLOATING NIGHT CLUB AMUSES VISITORS IN VENICE

Venice, famed for its labyrinth of waterways which serve as streets, now has a floating night club. It is a lavishly decorated barge which at night is a mass of colored lights. The boat is fitted up with a dance floor surrounded by tables for refreshments and a platform for the orchestra. The floating cafe is operated by one of the large Venetian hotels.

NUT IS LOCKED FAST TO BOLT BY A REMOVABLE PIN



Nuts can be locked in position at any point desired on bolts by means of triangular pins which form a wedge to prevent the nuts from jarring loose or falling off, although both pins and nuts are easily removed. The nut has an annular or circular groove at either end or in the middle. This is at right angles to the axis of the nut, so the thread of the bolt comes down to meet it. There are two or three entrance slots in each nut so that one or more pins may be inserted. When the nut is in position, the lock key is wedged into the slot. This prevents withdrawing the nut unless it is tightened slightly, which loosens the pin.

INCREASE IN PRIVATE PLANES IN GREAT BRITAIN

Nearly 300 men and women in England now operate their own private airplanes, and more than two dozen own two or more ships each. Many business men are acquiring their own ships in order to transact business on the continent more quickly, and a small plane now can be maintained in that country at a cost equal to that of keeping a good racing car in condition. One quarry firm is regularly sending out samples of stone by air to its customers.

¶A volcanometer, whose thermostat attachment warns of approaching danger, has been installed on Mount Pelee to warn of coming eruptions.

WOOD PLIABLE AS LEATHER HUNG LIKE WALLPAPER

Flexible wood that comes in rolls like linoleum and is as pliable as leather can be hung on plaster walls with ordinary paperhangers' tools, thus giving the effect of fine cabinet wood paneling. The product is not an imitation or wood substitute, but a real wood veneer, mounted on stout cloth. After it is in place on plaster, wallboard, or even metal, it can be finished like any ordinary wood surface. The grain effect is that of the natural grain of the tree, and unusual and strikingly beautiful effects can be achieved with the flexible surfacing. It is applied with or without moldings, and is made in oak, mahogany and American walnut.

ODOMETER MADE BY FRANKLIN TO MEASURE POST ROADS

Benjamin Franklin devised an odometer, the forerunner of the present day speedometer, to measure post roads while he served as postmaster-general. This instrument, which later belonged to Thomas Jefferson and now is in possession of the Franklin Institute in Philadelphia, was attached to Mr. Franklin's carriage in which he traveled some 1,600 miles inspecting roads. His carriage was followed by a cart carrying milestones and, when the apparatus registered a certain mileage, a stone was dropped. It was actuated from the carriage wheel, 400 revolutions of the wheel constituting a mile. The construction was crude, but the principle was the same as that used today.

Odometer Designed by Benjamin Franklin to Measure Post Roads; It Was Attached to His Carriage

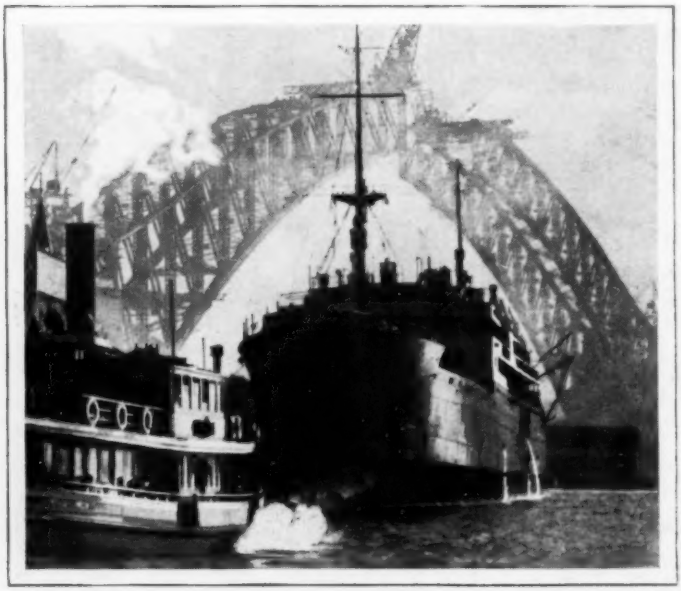
Slated-Cloth Blackboard in Reversible Rack, Which Can Be Turned without Removal from Wall

REVERSIBLE MAP RACK TURNED WITHOUT DETACHING

Chart and map racks now are available which can be turned without detaching them from the walls. The rack is suspended from a small plate containing a spring friction hinge which allows the rack to turn when the map or chart is rolled up. When the reverse side of a chart is to be consulted, the chart is rolled and the frame is turned on its hinge to bring the back side out, after which the chart is pulled down. Slated cloth blackboards also are fitted with these racks.

HOW TO FIND TIN

Tin, the one metal which the United States must obtain in considerable quantities from foreign sources, is much sought in this country, and there is a very simple test for ores suspected of containing it. A piece of sheet zinc is placed in a shallow dish and the sample of ore is laid on the zinc. Hydrochloric acid is poured on the zinc, and if there is tin in the mineral, it will soon appear on the surface of the ore as a gray powder.



In the Background May Be Seen Structural Work on the Largest Arch Bridge in the World, at Sydney, Australia, Completed Recently

LARGEST ARCH BRIDGE CLOSED IN HARBOR AT SYDNEY

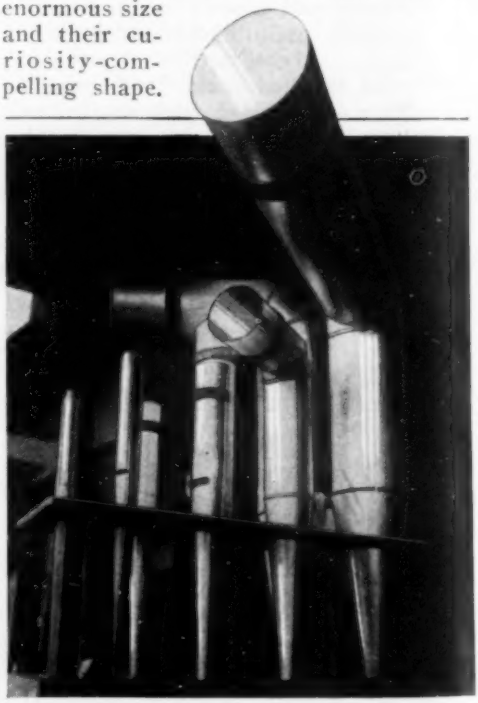
Two 14,000-ton halves of steel were lowered into place recently to complete the structural work on the largest arch bridge in the world. It is located in the harbor in Sydney, Australia, and connects the business and residential districts. The span is 1,650 feet long.

LIGHTNING LIFTS SIGNAL FLAG ON TRANSMISSION LINE

Just as the rural-mail man lifts the flag on the roadside box to indicate he has left something there, high-voltage electric charges now also put up a little flag to show that they have visited one of the steel towers supporting high-voltage transmission wires. Following an electric flash from lightning or from high voltages induced by lightning discharges at a distance, a white signal in an instrument on top of the tower springs into view, warning the line patrolman to inspect the insulation for possible damage. The instrument is called a surge indicator. Formerly it has been necessary to inspect insulators regularly with fieldglasses, but not all damaged parts can be seen from the ground, and some that seem damaged often are not seriously affected. The surge indicator gives a definite check on condition of insulators. It consists of a small releasing link and an indicating disk mounted in a nine-inch case. The link disrupts when a surge occurs, and a spring pressure turns the disk to visible position.

GIANT ORGAN PIPES FOR STUDY OF SOUND

Organ pipes of mammoth proportions and unusual design have been installed in the Institute of Acoustics which was opened recently in Berlin. These pipes, with their flaring tops and horizontal sections joined to the vertical, at first glance might easily be mistaken for a system of water mains because of their enormous size and their curiosity-compelling shape.



Organ Pipes of Gigantic Dimensions Installed in the Institute of Acoustics in Berlin

Harvesting Linens from Home-Grown Flax

Harvesting Flax in Oregon with Tractor Outfit; the Machine Is a Product of the State Prison Shops at Salem and Incorporates the Latest Improvements in Units of This Kind

By PATRICK DUFFY

THE FINEST of linens made from home-grown flax—that's the latest contribution of science to the economic life of America. Born within the walls of a prison, the industry is a lusty infant. The state of Oregon last year made a profit of $97,000 on total sales of $300,000, while two mills in the city of Salem reaped handsome profits by the spinning of pure-linen products from flax grown and prepared at their very doors.

Fiber flax, of course, is one of the oldest of crops. It crossed the Atlantic with the Pilgrim Fathers and for more than 200 years was a staple. Nearly every pioneer household had its small plot of flax from which to make homespuns and linsey-woolseys, but the invention of the cotton gin in 1793, preceded by the spinning jenny in 1775, resulted in the phenomenal rise of cotton—a competitor destined to oust the flax industry from its time-honored position.

The onward march of science delivered the final knock-out blow. Other industries flourished thanks to labor-saving devices, but flax growing and harvesting continued to be done by hand. Pulling, retting, breaking and scutching remained hard and unpleasant tasks unrelieved by inventive genius. And can you imagine an American farmer, with tractors, combines, gas engines and electric motors to do his work, content to harvest and prepare a crop by hand? And how could such farmers expect to compete against the flax grown in other countries with the aid of cheap peasant labor?

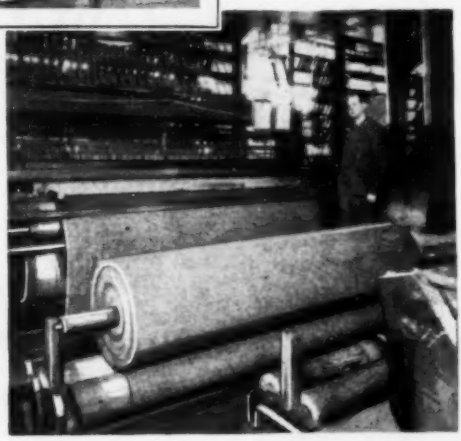
Flax growing fell on evil days. Although the United States is the world's greatest market for linen goods, four-fifths of its linen supplies are imported. Each year this country manufactures something like $10,000,000 worth of linen goods from flax imported from Europe, and buys $40,000,000 worth of linen supplies from foreign sources.

Such was the situation until the magic of science gave birth to a linen industry in the prison at Salem, Oreg. The secret of this transformation lies in the invention of labor-saving devices which enable

American flax growers to compete successfully against the cheap labor of Europe. Under the old method of hand pulling the crop, it cost from $20 to $25 per acre to harvest flax. One-eight of an acre a day was regarded as fast work for a man blessed with deft fingers and a strong back. With the aid of one of the latest flax-pulling machines, the cost is slashed to less than $3 per acre. With this machine, the flax is pulled up by the roots, carried upright into the binder by three sets of belts running in contact and bound into eight-inch sheaves with the root ends all square across the butt. These are laid on the ground in neat rows. With one of these machines the work of fifty men is performed in a day.

The mechanical puller was the invention of a group of Canadians headed by Colonel W. B. Bartram, a war veteran. In 1923, one of these machines found its way to Oregon, and with it went the colonel. In the prison fields and machine shops numerous experiments were made, with the result that improvements were effected. Today, the prison shops are turning out mechanical pullers at a profit to the state —machines which give satisfaction to the growers in every way.

Then there was the process of retting. In Russia, where dew retting is in vogue, this takes about eight weeks. In Belgium, where flax is placed in streams or reservoirs, retting requires about two weeks. In Oregon, thanks to a new method, this process is completed in less than five days. After numerous experiments, a tank was evolved, equipped with a heating system, which warms the water to eighty-four degrees Fahrenheit. The water in the tank is kept in slow circulation. By so doing, the conditions which obtain in the river Lys, Belgium, are duplicated, and everyone knows that the world's finest fiber is retted in that river.

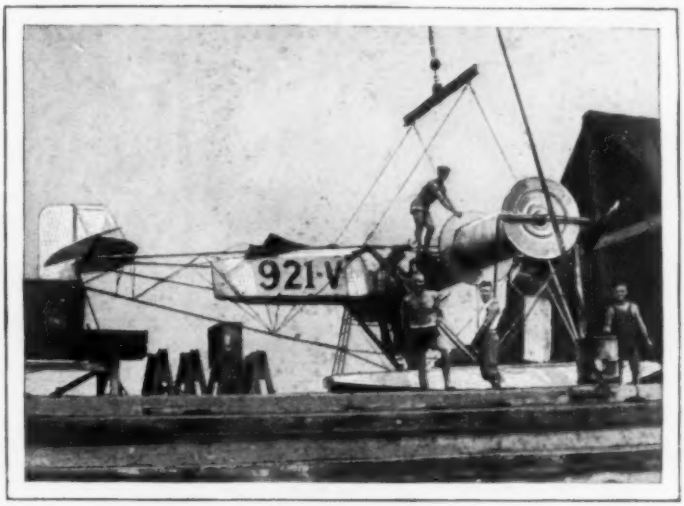


After retting, the flax bundles are placed in neighboring fields for three or four days, to dry and bleach in the sun. Then they are brought to an ingenious breaking-scutching machine —the only one of its kind in America. Until quite recently it required thirty

Weaving Linen Towels; Making Carpets from Waste Flax Straw, and Pulling Flax Fiber by Hand

machines operated by eighty-five men to break and scutch 600 pounds of fiber per day. But with the aid of the new combined breaker-scutcher, a crew of six men produce more than 1,000 pounds of fiber in eight hours, and the cost has been slashed from six cents to one cent per pound.

All this means that the whole industry has been mechanized and that American flax growers can successfully compete against the cheap labor of other countries. Last year 6,250 acres were devoted to this crop, and it is hoped that next year more than 10,000 acres will be grown.



A Wingless Aircraft Equipped with Rotors, or Large Spool-like Cylinders Instead of Wings; the Ship Has Tremendous Lifting Power

A WINGLESS ROTOR AIRCRAFT SUCCESSFUL IN TESTS

Equipped with rotors, large spool-like cylinders, instead of wings, an aircraft recently was successfully flown by its inventors, who have been working on it in secret on a barge in Long Island sound. Aside from the rotors replacing the wings, the all-metal plane is similar to a seaplane. A single engine in the nose supplies traction through a three-bladed propeller and an auxiliary air-cooled motor rotates the cylinders. It has been declared that the ship will lift nearly ten times the load of an airplane of equal weight or lift area, and at the same time reduce the resistance so that greater speed is possible.

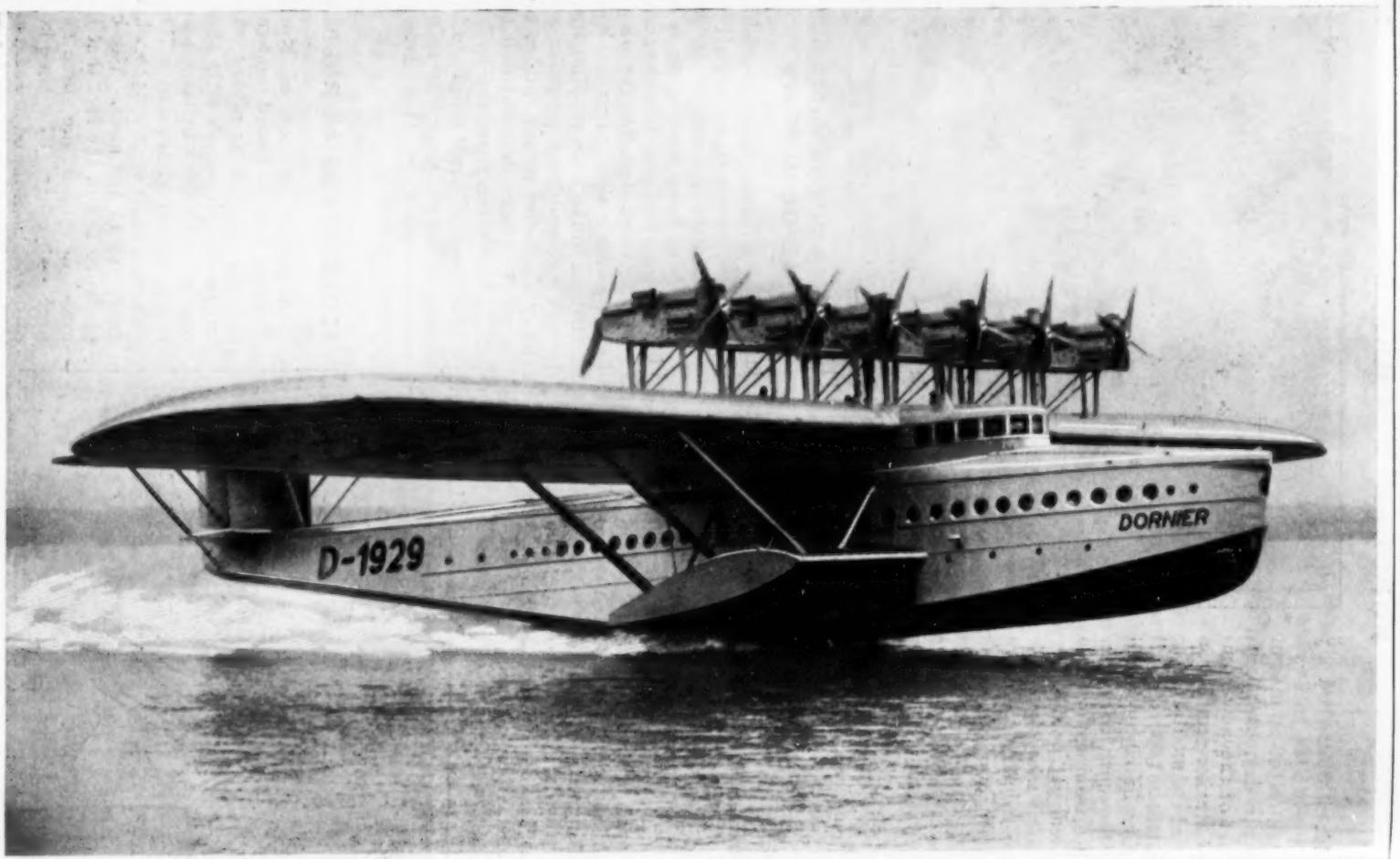
SEAPLANE BUILT FOR A CHILD HAS FOUR-MILE SPEED

For the amusement of an English child, a miniature seaplane has been built and equipped with a real motor. The little amphibian consists of a small airplane with tiny wings mounted on pontoons considerably larger in proportion than the ship. The craft does not fly, but its four-cylinder motor propels it over the water at the rate of four miles an hour.

Baby Airplane on Big Pontoons Designed for a Child

STONE BENDS AS RUBBER

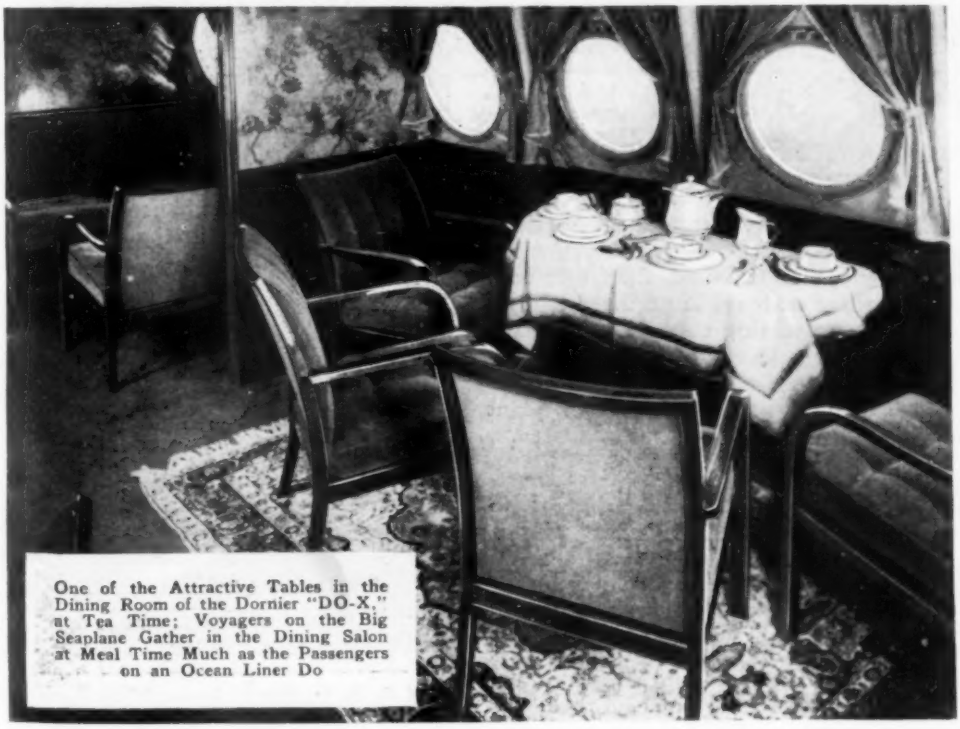
In certain sections of North Carolina may be found sandstone that is as flexible as rubber when cut in thin strips. A strip about one-half inch thick behaves much like a leather strap, and a large slab sags of its own weight when supported at the ends. The explanation lies in the fact that the grains of sand in the stone slide over each other. The same kind of stone also is found in India and Bolivia.



The German-Built Dornier "DO-X," the World's Largest Seaplane, Taking Off from the Waters of Lake Constance in Switzerland for a Trial Flight after the Installation of American Motors; the American Engines Are Expected to Give an Increase of 1,500 Horsepower, Making a Total of 7,500 Horsepower

LUXURIES ABOARD WORLD'S LARGEST SEAPLANE

Left, Pilot Seated at Controls of the German Ship "DO-X," the World's Largest Seaplane, While It Was Being Groomed for a Transatlantic Flight; Above, the Commander's Room aboard the Giant Plane Which Contains Many of the Luxuries Found on the Modern Ocean Liner; It Is Now Fitted with American Motors



One of the Attractive Tables in the Dining Room of the Dornier "DO-X," at Tea Time; Voyagers on the Big Seaplane Gather in the Dining Salon at Meal Time Much as the Passengers on an Ocean Liner Do

The German-Built Dornier "DO-X," the World's Largest Seaplane, Taking Off from the Waters of Lake Constance in Switzerland for a Trial Flight after the Installation of American Motors; the American Engines Are Expected to Give an Increase of 1,500 Horsepower, Making a Total of 7,500 Horsepower

Modernistic Street Clock Operated by Electricity; the Base Is of Chromium and Vitrolite

MODERNISTIC ELECTRIC CLOCK KEEPS CITY'S TIME

One of the most unusual street timepieces ever constructed is a modernistic electric clock in Oakland, Calif. It consists of three dials set in an inverted pyramid, the supporting column being made of chromium and vitrolite. It is illuminated by neon electric lights and is operated by current from a power plant where a master clock keeps it regulated.

GALE FROM PLANE PROPELLERS STOPS GRASS FIRE

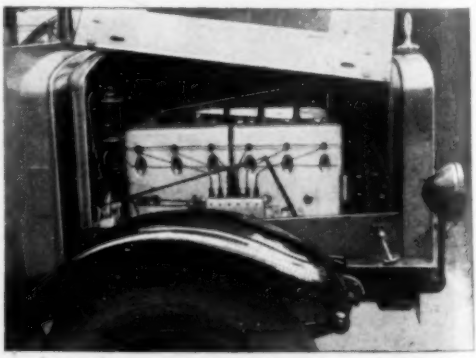
Airplane propellers produced an artificial gale that probably saved the ships and other property on an army air corps flying field in California recently. A grass fire started on the field and swept toward several planes standing lined up ready for students. The pilots turned their ships away from the flames, held them stationary by means of the brakes, and tuned up the motors. The propellers created such a blast of air that the fire was turned back on itself and did not come within twenty feet of the ships. Cadet flyers and mechanics then beat out the flames.

TREETOPS LIKE DESERT PLANTS GROWTH STUDIES SHOW

Exposed to hot sun and winds, and far from the base of water supplies, a treetop becomes more or less like a desert plant, according to Prof. Bruno Huber, of the University of Freiburg, Germany. Some of the leaves automatically provide special protection against the drying effects of the air just as do varieties of desert plants. By growing thicker skins, smaller cells and smaller pores, they keep down the rate of evaporation.

DIESEL ENGINE FOR MOTOR BUS EFFECTS BIG FUEL SAVING

Daimler, the German automobile concern, has made a type of Diesel motor for busses which operates without a compressor and uses crude oil for fuel at a saving of seventy-eight per cent as compared with gasoline. It develops seventy horsepower, is virtually without exhaust gases and almost free from vibration. The fuel oil does not go into the cylinders direct, but is forced into an antechamber where pressure causes partial combustion, the process being completed in the cylinders under pressure.



Diesel Engine for German Busses, Which Burns Crude Oil and Operates without a Compressor

NEWS PHONED CROSS COUNTRY RECORDED ON WAX

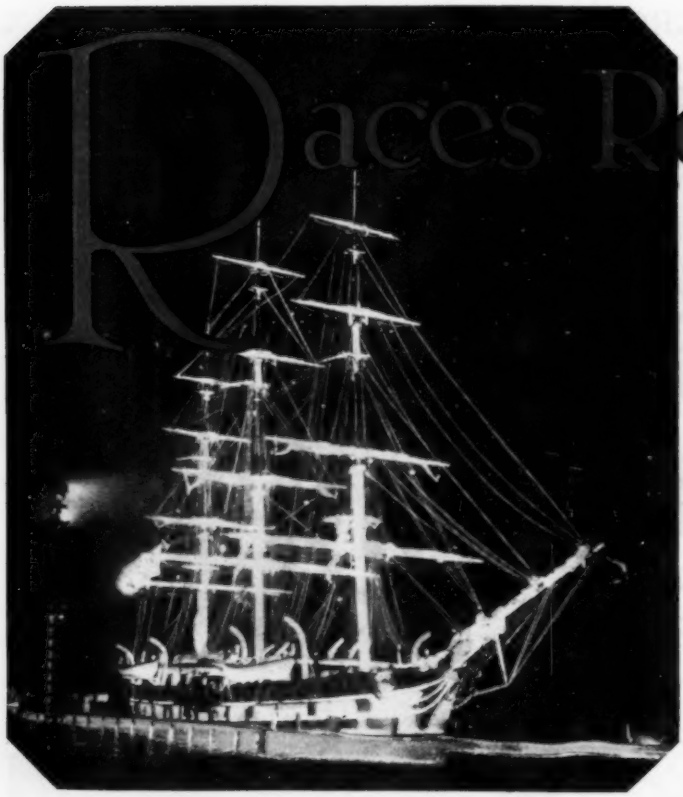
Dictating Message over Telephone and, Right, Recording Apparatus; Below, Typing Out Story at Receiving End

To speed up transmission and reduce expense, a reporter covering a church convention in San Francisco recently telephoned his daily stories to his newspaper in Washington, the dictation being recorded on a dictaphone at the receiving end and later transcribed. The telephone-dictaphone hookup was decided on when it was found that sending stories by regular telegraph would be expensive, while sending them by wire at press rates would require considerable time for transmission. A telephone was leased each evening, beginning at six o'clock, when the reporter dictated his story at the rate of about 200 words a minute. At the receiving end the telephone was connected with a dictaphone through an amplifying unit. Six minutes of dictation filled a record, and the reporter than paused for fifteen seconds while records were changed. As soon as the first record was completed, a typist started turning out the pages of copy. Experiments now are being made in dictating into a dictaphone at the sending end, and sending this record, greatly accelerated, by telephone to be recorded by a dictaphone at the receiving end. At this end, the dictaphone record is slowed down for a typist to catch the words. If these tests prove successful, words would be transmitted by telephone faster than the person who spoke them was able to utter the sounds.

SAW WITH GRADUATED TEETH STAYS ON CUTTING LINE

Hacksaw blades with graduated teeth are prevented from breaking out when the cut is started, and keep the saw from slipping off the cutting line. The teeth are small at the tip of the blade and grow larger as they progress toward the rear. The saw also induces the operator to start with the very end of the blade. The blades are for handsaws, and have thirty-two teeth per inch at the tip and only twenty at the handle end.

Races Revive



Famous Old Whaler "Charles W. Morgan," Now Moored in Concrete, Floodlighted in Answer to Salute from Passing Vessel

"STEADY there, boys! Just let her slide up to the mark. Bend your backs. That startin' gun's goin' to go in a second. Hold her! Ste-a-d-y. . . . Now! Pull! Pull! Hit up that stroke. Dig those oars in. Come on! Pull!"

Once again, old Capt. George Fred Tilton is poised in the stern of a whaleboat, his feet far apart, his giant body swaying to the rolling waves as he swings the long sweep oar that steers the craft. Before him, five sturdy oarsmen bend their backs as the boat speeds toward the finish line.

Cap'n George Fred can almost imagine that he is back in the old days when the greatest fleet of whaling ships the world has ever seen sailed out of New Bedford to scour the seven seas for oil and bone. Then—fifty and even one hundred years ago—whaleboat races were sure to be rowed in The Cove whenever two or more whalers made the home port at the same time. Now the races are but the climax of the Whaling City's annual celebration.

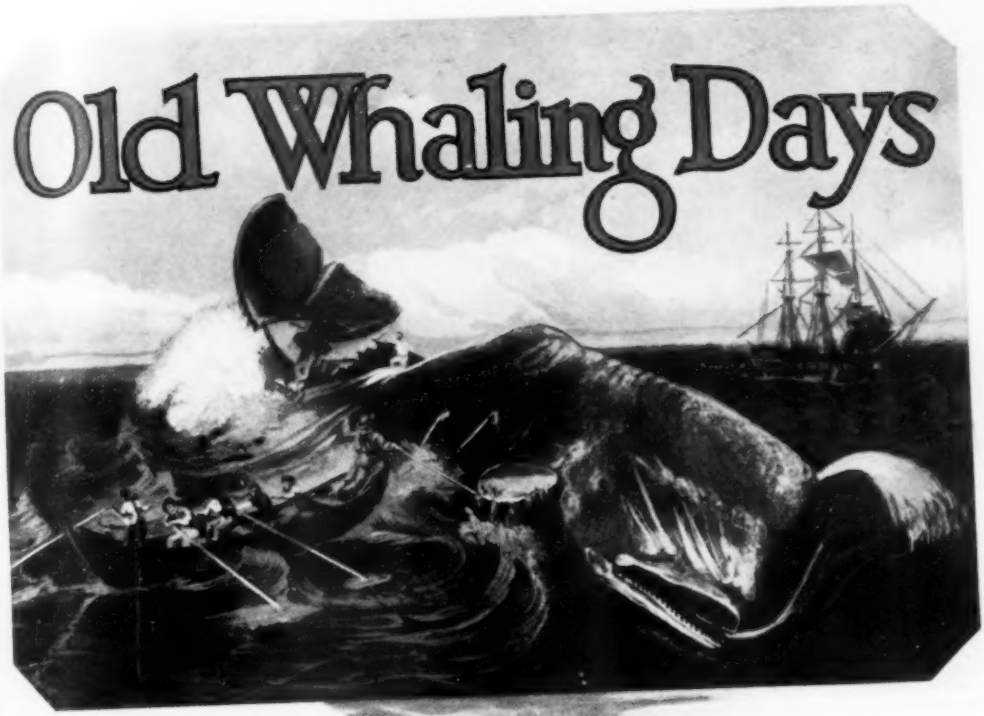
They're great oarsmen, these young descendants of the ancient whalemen rowing their hearts out for the hard-bitten old captain. But they will never know the thrill of a real whaleboat race, far from applauding multitudes, where the prize was a mammoth sperm whale, worth anywhere from $8,000 to $12,000 to their ship. For the sea-going glory of New Bedford has faded with the demand for whale oil and whale bone.

Nearly fifty years have passed since the whaling industry was the mainstay of the Massachusetts city, the bread and butter of its inhabitants. Not a single one of the old whaling ships is left to sail the oceans. But the Whaling City keeps their memory alive by its remarkably interesting whaling museum, by an annual celebration and by the heroic monument in the public square, where, in everlasting bronze, a sturdy harpooner is poised with his iron above the old challenge of the men of New Bedford to the leviathans of the deep, "A Dead Whale or a Stove Boat."

When the world ceased wanting whale oil and bone, the men of the Whaling City turned from the sea to the producing of cotton stuffs in mills. But the years have failed to wipe out their love for the traditions of whaling, bred into them through the generations. So when, last year, Captain Tilton suggested a revival of whaleboat racing, the idea was received with a yell of delight.

Would they have a whaleboat race? You bet they would, declared the leftovers from whaling days, and the biggest

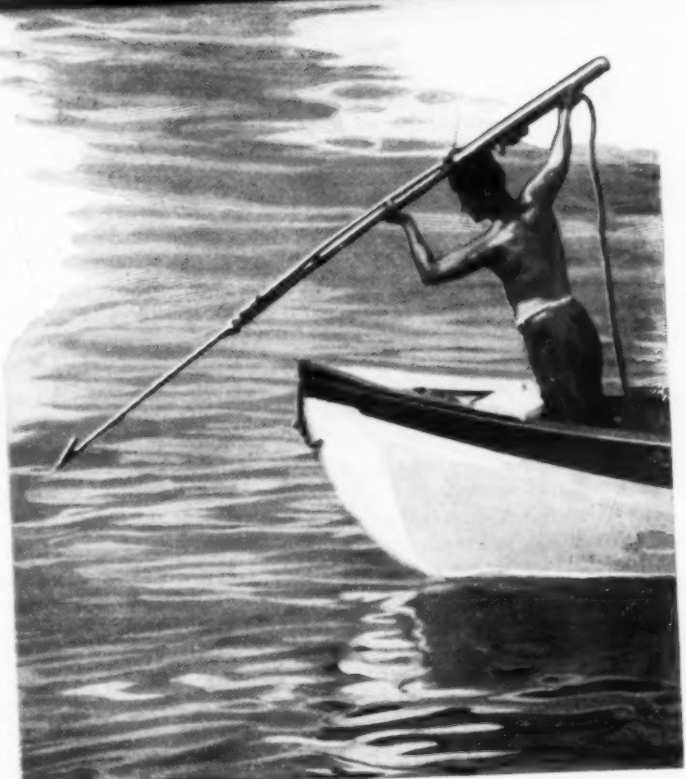
Old Whaling Days



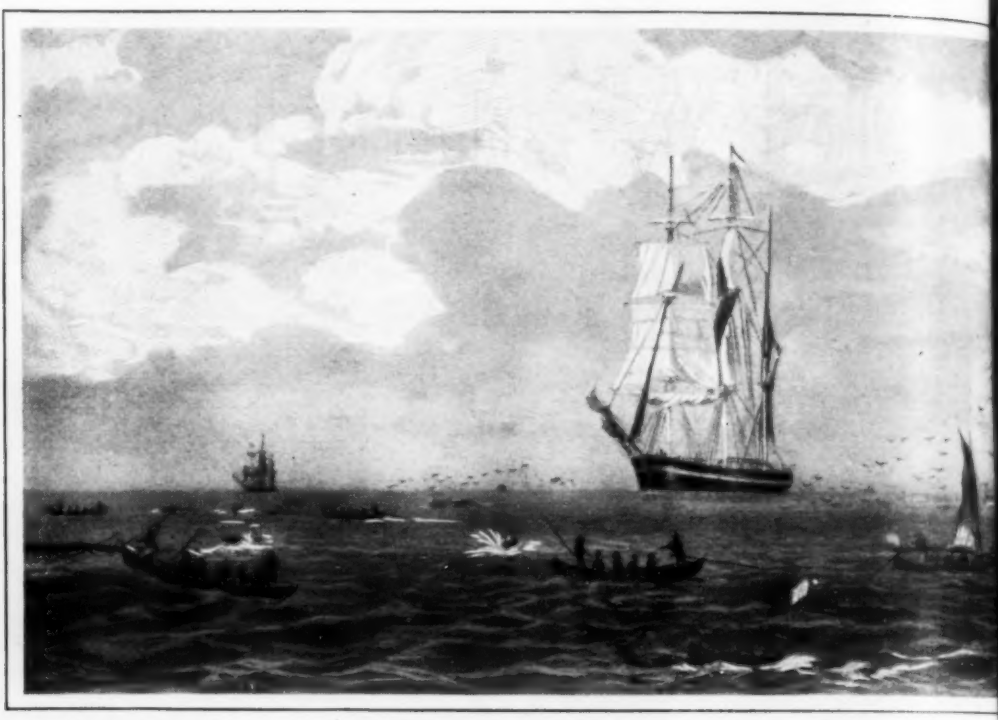
one ever pulled off. Every ex-whaleman in the town jumped into the thing and rowing crews were organized right and left. But soon their plans struck the snag. Of all the whale boats in use when the industry was at its height, only two were to be found that could be put into serviceable condition.

Two more were available from the last survivor of the old whaling fleet, the full-rigger "Charles W. Morgan," now set in concrete close to high-water mark at Round Hill, the estate of Col. E. H. R. Green, a few miles from New Bedford, as a memorial to the whalers of the brave old days. So but four crews, each commanded by a real old-timer, could enter the contest.

There's no fence around



Capturing Sperm Whale as Portrayed in Rare Print, and Type of Harpoon Used When the "Charles W. Morgan" Sailed the Seas



Exciting and Interesting Episodes in a Whale Chase and Capture in the Days of Sailing Vessels and Hand Harpoons, as Shown in an Old Print

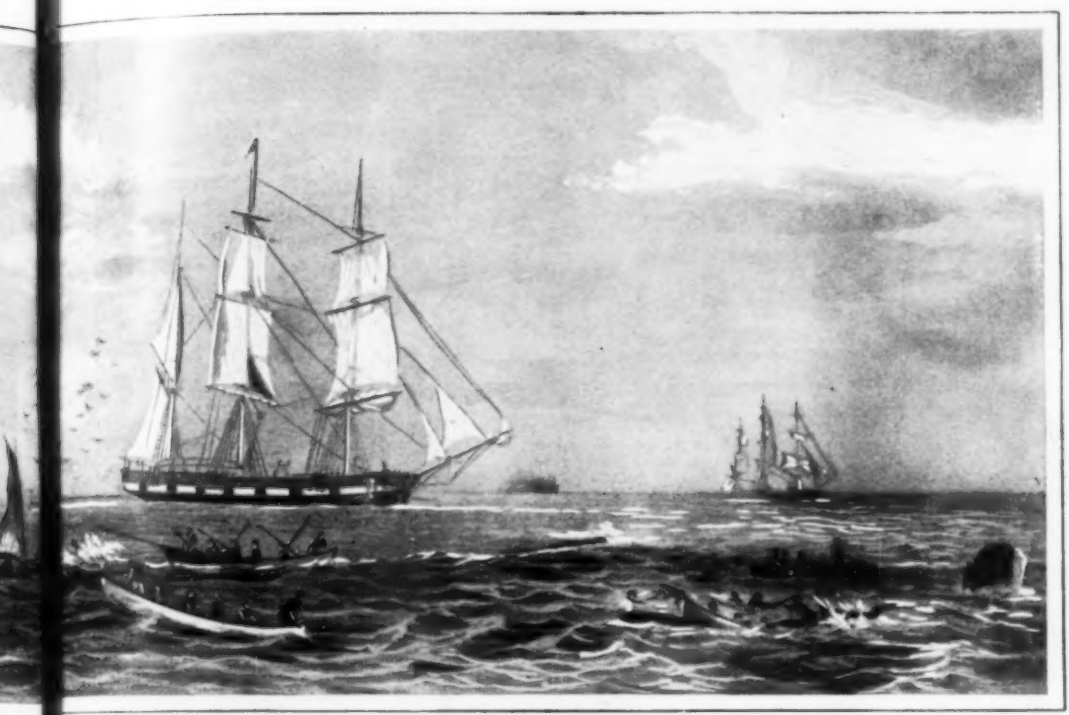
the great estate of Hetty Green's son and no gate closes the entrance to it. Instead, there is a big sign giving invitation to enter and look the place over. Over 200,000 visitors from every state in the Union and several foreign countries accepted the invitation last summer and boarded the old ship to hear Cap'n George Fred, who is now her land-bound skipper, tell the epic tales of whaling days.

The whalers always cruised with their boats swung out on the davits, ready to be lowered instantly. At the first cry of "Thar she blows" from the masthead, a mate and five men of the crew jumped into each boat, lowered and were away in a few seconds. A queerly unbalanced source of power the boat crew appeared as they pulled. The mate stood in the stern, steering with a long oar. Three oars dug into the water on the starboard side, but only two on the port side.

That unbalanced power seems strange, but was founded on good sense. During the chase of the whale, every ounce of available pulling strength was needed. The forward place in the boat was occupied by the harpooner, who otherwise would have nothing to do until the craft was alongside the whale. So he pulled the fifth oar, the mate keeping the boat on a straight course. When the whale was overtaken, the harpooner stowed his oar and stood in the bow ready to thrust the iron home. Then, when finesse rather than speed was needed, the rowing power was balanced and the boat became much easier to handle.

Perhaps it would be well to let Cap'n George Fred tell of those old-time races when a whale was the prize. Those who know say that he brought into New Bedford more oil and bone than any captain now surviving, which should give him standing as an authority on whaleboat racing. He'll tell the rest of the tale:

"It takes a lot of practice to get a whaleboat crew working together. See those young fellows on our crew; every one of them was a mighty good oarsman when he came with us. Yet it took all of six weeks to get them into shape for the race last year. Look at those oars. Two of them are fourteen feet long and the rest twelve feet, and they're heavy—much different from those college crews use. A



Thrilling Battles with Angry Whales Were Common, and Boats Were Not Infrequently Crushed as the Captured Monsters Tried to Free Themselves from the Harpoons

man cannot learn to swing them in a day.

"Funny how putting on these races brings us up against the same problems we had in whaling days. In the matter of men, we were up against the same thing then. It was seldom, if ever, that we could ship a whole experienced crew; if half of them were old hands, we were lucky. The first calm day we'd get after leaving New Bedford, the training of the green-horns in how to handle a whaleboat would commence.

"We'd get all boats over the side, crewed about half and half with experienced and green men. Out there on the broad Atlantic, far out of sight of land, we'd pull off race after race around the slowly moving ship. Never, during a cruise, would we leave off our boat practice; every day that the ship wasn't making too much headway, we'd be out rowing. Then we'd sight our first whale, and whether we killed him or not depended upon how well the crew had learned to handle the boats.

"For there's a lot more to killing a whale than simply rowing up and sticking an iron into him. Whales are scarey and galley (take fright and dive) at the slightest suspicious sound they hear. A whale's eyes are in the sides of his head, so he can see anything that is coming up from either side but nothing that is approaching head-on or from behind. Nobody would care to risk a head-on collision with a whale, so we always attacked from behind.

"It was always easy enough to keep out of the animal's sight, but to approach so quietly that he couldn't hear us was something else again, for whales have a mighty keen sense of hearing. However, he's a fairly regular-habited sort of a mammal, and we'd take advantage of his regularity. Just as methodically as clockwork, he'll blow, draw in air, dip through a wave, come up and blow again.

"When he blows and takes in air, the operations are accompanied by a terrific 'swoosh' that drowns out every other sound for yards around. So when we came up close to him, we did all our rowing when he was blowing and sucking. I'll tell you how it was done. Just imagine there's a big sperm lying there off the end of the dock. The boat is coming up

New Bedford Wharves, in 1870, Piled with Whale-Oil Barrels; Capt. George Fred Tilton at Steering Oar

on him. The harpooner has stowed his oar and is up there ready with the iron.

"See! There goes the whale's head into a wave and the men lie on their oars, motionless as statues; now he comes up and there he blows. 'Pull—pull—pull,' orders the mate. There's just time to get in three strokes during the time the whale is blowing and drawing in.

"'Lie,' snaps the mate as the sound dies, and instantly the men are motionless, but the boat keeps gliding forward from the force of the strokes. 'Pull—pull—pull,' the mate orders again as the animal blows.

"Now the boat glides past the flukes (the tail), and the harpooner is tensed ready for the thrust. Slowly the boat creeps forward; now the bow is just abreast the hump, and the oarsmen and mate hold their breath. Two more feet ahead, and the harpooner lunges, the full weight of his body in the stroke.

"'Stern all,' bellows the mate. There is no need for silence now. They're fast to several tons of whale and he's going to stir up ructions around there. Better get the boat away from that first great flip of his flukes. Such a flip has often thrown a whaleboat and crew twenty-five feet in the air and smashed both boat and men.

"He's a fighter and the boys have their work cut out for them. He turns and comes quartering toward the bow of the

boat. 'Stern three, pull two,' shouts the mate as he puts his muscles to the steering oar. (The starboard side is always the 'three' side and the port is the 'two' side, whether the harpooner's oar is out or stowed.) The boat spins and the whale goes harmlessly past, the harpooner jabbing home a lance as it passes.

"Right there you see the training of the boat crew saves them from disaster; if that whale ever hit the boat, it would be goodby boat. And when other boats come up you get another exhibition. There's your whale rushing the boat, threshing about, lifting his flukes high in air and the sea dyed red from the lance wounds.

"You'd think that no small boat could live a second in that turmoil. Yet, when the second boat comes up, it dashes in right up against the giant body, while the harpooner gets home his iron. That takes real boat handling."

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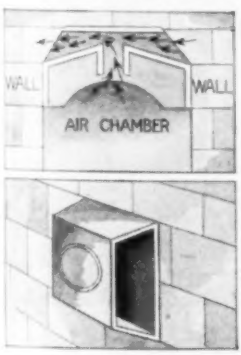
Giant Water Lily in Kew Gardens, London, Getting a Bath and Scrubbing; This Lily Is Strong Enough to Support a Man's Weight

HOLLOW VENTILATING BRICKS CIRCULATE FRESH AIR

Giving efficient ventilation to a room and at the same time excluding drafts and troublesome insects, a special type of hollow air brick has been made by an English inventor. These bricks are built into the wall, the air passages being so constructed that warm air is drawn out of the room when the wind blows, while the opposite side drives in a current of pure air when there is no breeze, without causing a draft. The bricks may be made of concrete or fired clay and may be colored to correspond to the building materials used.



GIANT WATER LILY GIVEN BATH TO KEEP IT HEALTHY

Giant water lilies, known as "Victoria Regia," growing in Kew gardens, London, are given regular baths and thoroughly cleaned by attendants who don bathing suits for the process. This particular lily has leaves many feet across, some being so strong that a man is easily supported on them. The lilies are washed to free them of any parasitic vegetation.

LUMINOUS QUALITY OF RADIUM PRODUCED BY IMPURITIES

Pure radium is not luminous, the faint glow from tubes of radium salts coming from impurities. Luminous paints are made by mixing radioactive material with phosphorescent substances, such as zinc sulphide. In the United States, the paint used on watch dials consists mainly of crystalline zinc sulphide mixed with various proportions of radium, mesothorium and radiothorium to obtain the desired amount of luminosity. Luminous paints are of military significance, being used for the illumination of gun sights and compass cards and wherever other forms of illumination might betray one's presence to the enemy. The ingredients and formulas for luminous paints differ in various countries and are frequently changed.

Giant Radio Tube for Broadcasting Which Requires Five Tons of Water an Hour for Cooling

SIX-FOOT RADIO TUBE COOLED BY FIVE TONS OF WATER

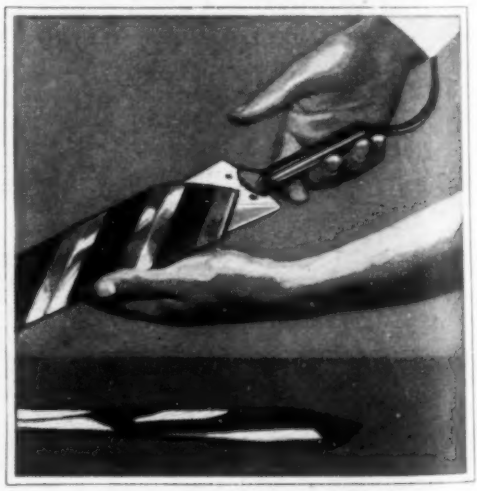
Six feet high and weighing sixty pounds, a giant 200-kilowatt radio tube is being used by the transmitting station KDKA, in Pittsburgh. Cooling the big tube was one of the problems engineers faced, and they solved it by inclosing the tube in a water jacket through which five tons of water pass during each hour it is in operation. One hour's operation heats enough water to supply the requirements of an average home for several weeks. The power capacity of the tube is equivalent to that needed to light 1,000 average homes. It is not simply an enlarged edition of a smaller tube, but is of an entirely novel design.

FROM JUNK PILE TO PERFUME

Junk that the people of Los Angeles discard is being converted into a fortune by a by-products company. At first the company contracted with the city to take over and dispose of all non-combustible material found in the daily collection of garbage. At that time it was planned to use only the tin cans, but the old tin in itself did not provide sufficient income. Now, however, the company works over ninety tons of old garbage metal a week, and handles 500 tons of old auto bodies and parts a month. Sorters sterilize and pack all old bottles, while broken glass is shipped to China to be used in making pottery. Leather from old shoes, when treated by acids, produces several useful substances, including a base for perfume. The company, which now handles virtually every bit of waste collected about the city, except stale foodstuffs, plans to open branches in other cities soon.

ELECTRIC IRON FOR NECKTIES RENEWS OLD CRAVATS

To renew wrinkled and shabby cravats, an electric necktie iron that is almost automatic in operation now is available. It is shaped like the four-in-hand tie with pointed end and is plugged into a light socket and the end is inserted at the tip of the tie between the front and back surfaces. The heat causes the wrinkles to disappear, and the heat and shape of the iron restore the tie to its original appearance. A thermostatic control prevents overheating, and less than a minute is required to press a tie.



Form-Fitting Electric Iron That Rejuvenates Wrinkled and Shabby Neckties

ARCTIC MYSTERY OF ANDREE'S FATE NOW SOLVED

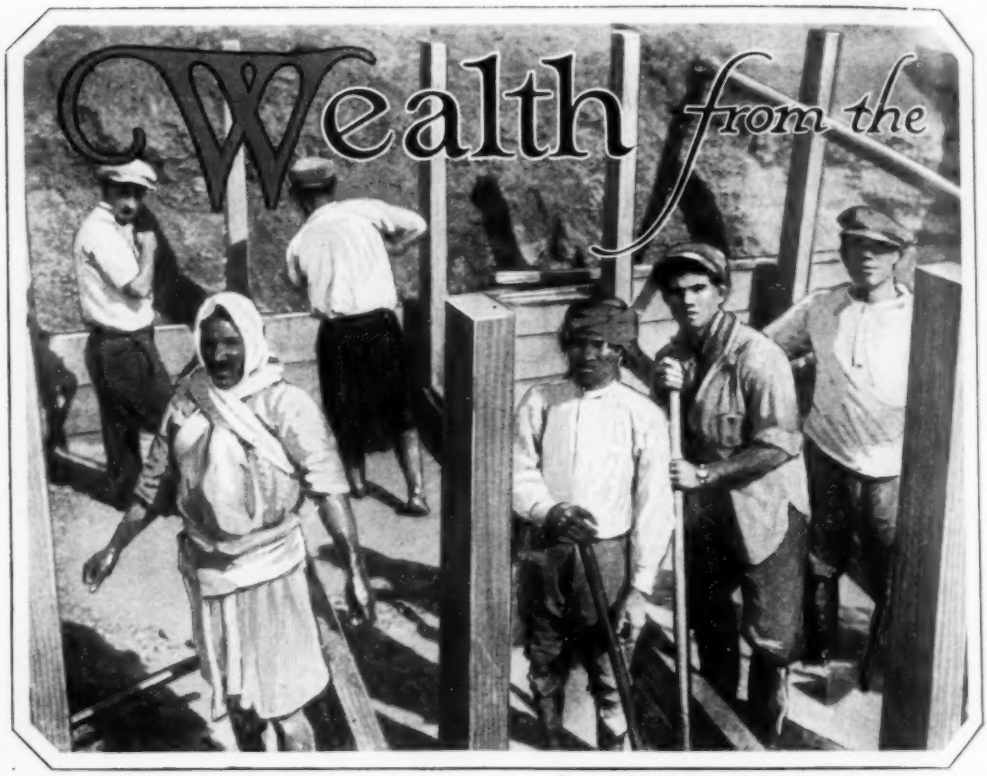
Above, Proposed Route of Doctor Andree, and Where the Remnants of the Expedition Were Found; Right, Photograph of Andree and His Balloon

Probably the tightest balloon bag ever made, at least up to that time, was that used by Salomon August Andree, Swedish explorer, who, with two companions set out in 1897 on the first aerial expedition to the North Pole. They disappeared and never were heard from until a few weeks ago, when a Norwegian exploring party found their bodies, some of the records of the trip and remnants of the equipment on a barren waste of island in Franz Josef land. Andree prepared for the trip several years beforehand. The balloon was built in Paris and cost over $10,000. It held about 170,000 cubic feet of hydrogen gas and was made of three thicknesses of silk, varnished with a special preparation. A heavy hemp netting incased the bag and supported the car of wicker and wood, steel being avoided in order not to interfere with the magnetic instruments. In the car were stored maps, books, kitchen utensils, ammunition, guns and other equipment, and provisions were held in other containers suspended from the big bag. It was estimated that a nine-months' supply of food was carried, and that if the explorers came down in a region where they could augment this with fish and game, they could exist for two years. Andree himself at first estimated that he could keep the balloon in the air a year, if necessary, but the chemist who made the gas used in it said, that despite the tightness of the bag, there were holes through which the gas constantly seeped. The chemist estimated that the balloon could remain afloat not over fifteen days, but Andree left Spitzbergen in 1897 confident that he could stay aloft for six weeks if he desired.

OYSTERS GOOD YEAR 'ROUND UNDER FREEZING METHOD

Oysters may be enjoyed all the year instead of during the so-called "R" months only, as a result of recently improved rapid freezing methods whereby the bivalves and many other kinds of food are kept fresh for longer periods of time. The freezing system prevents the destruction of the small cells in the food, hence keeps the articles in a state less likely to decay as well as being more nourishing and more palatable. With the idea has been developed a kind of showcase in which the foods are kept at a temperature of fifteen degrees Fahrenheit, if desired. In this way, oysters could be frozen and sold 365 days of the year, it is predicted. Experts believe that the present production of some 18,000,000 bushels of oysters per year will be increased to 100,000,000 bushels.

Wealth from the



Jews and Arabs Working Together in Making Canals in the Region of the Dead Sea, Where an English Company with Modern Machinery Soon Will Extract Chemicals in Large Quantities

CARAVANS of commerce rumble over the rock-ribbed slopes of Jericho and Jerusalem these days, carrying away the wealth of the Dead Sea. Without commerce or life, the curse of uselessness hovered over the Red Sea until now. The sultans of Turkey held it as private property, guarding its waters from the stir of whirring ship propellers and the hand of man.

The blight that fell 3,000 years ago was first lifted during the war by General Allenby. "Potash!" someone muttered in his ear as the British marched over scorching sands to Jerusalem. Potash! The Germans held the world at bay with Stassfurt potash. Prices had bounced 1,000 per cent. Armies of men and animals bled for potash. Allenby ordered an analysis of the Dead Sea. Gallon for gallon, these bitter waters were charged with more wealth than any sea on earth. One-third of the precipitate was salt. "But," said the shrewd chemist, figuring hurriedly, "here are 2,000,000,000 tons of potassium chloride; 980,000,000 tons of magnesium bromide; 11,900,000,000 tons of sodium chloride; 22,000,000,000 tons of magnesium chloride, and 6,000,000,000 tons of calcium chloride.

"This Dead Sea," exclaimed Allenby, "is our Eldorado!"

Twelve hundred billion dollars! A sum 300 times greater than Britain's total war debt to America lies in this basin, sunk as in a coffin, more than 1,292 feet below sea level. By a stroke of nature, it was chiseled out of the earth. Long before Joshua's trumpets blared and Roman hordes stormed the temple, a crustal readjustment ripped the rocks in twain, and made a basin to be filled by the River Jordan, flowing now red with blood, now white with sand.

On Jan. 1, 1930, an agreement for the Dead Sea concession was signed between the crown agents for the colonies and an international corporation. The government granted the company liberal rights to exploit the dissolved treasure by any

Dead Sea

method; but production by the tenth year should be no less than 10,000 tons of eighty-per-cent-pure potassium chloride; by the eleventh year and thereafter the annual production must reach 50,000 tons.

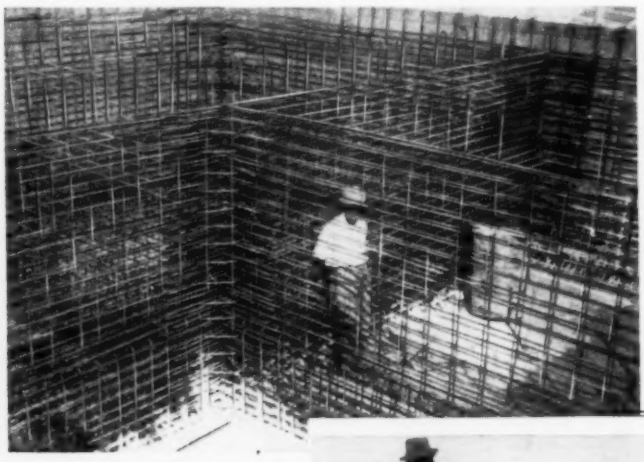
Although the work is still of experimental proportions, production is actual. The principal site is on the north shore, thirteen miles from Jerusalem by air line, twenty-five miles by mountain road. The Mediterranean is forty-five miles away, and the Suez canal, door to world markets, lies around the corner.

The Dead Sea occupies the lower end of a great fault line, extending from Mt. Hermon south to the Gulf of Akabah on the Red Sea. For 170 miles the fault runs below the Mediterranean. At about 1,300 feet below sea level, the Jordan discharges its mineral treasure into the Dead Sea.

Forty-seven miles long and ten miles wide, the sun evaporates about 6,000,000 tons of water daily from the Dead Sea's surface. This surprising evaporation surpasses the Jordan's inflow, and if it were not for minor streams, the lifeless sea might have dried up centuries ago. But on account of the accumulating precipitation and the growing delta of the Jordan, the Dead Sea is actually rising. Since the survey of 1883, it has risen twenty feet, and eight feet since 1900. Its greatest depth is 1,310 feet; hence the Dead Sea floor is 2,602 feet below actual sea level. A sudden change in climate might cause it to overflow its banks or shrink into a shallow pool.

Aside from natural forces, man governs the fate of the Dead Sea. Great quantities of water will shortly be drawn off to the evaporation vats on the one hand, and, on the other hand, power dams and irrigation schemes will diminish the discharge of the Jordan. The only hope of maintaining constant water level lies in the proposal of a German engineer for con-

A Modern Guide Post in an Ancient Land, Pointing the Way to Jerusalem, Jericho and the Dead Sea



Top, Steel Framework of Water Tanks Rising Where the Children of Israel Wandered; Below, Workmen Excavating a Feeder Canal

necting the Mediterranean with the upper Jordan by tunnel and canal. This would serve not only to replenish the Dead Sea but also provide for a hydroelectric development to generate 1,000,000 horsepower, enough to turn the industrial wheels of Turkey and Palestine combined. The effective vertical fall between the two water bodies is about 900 feet.

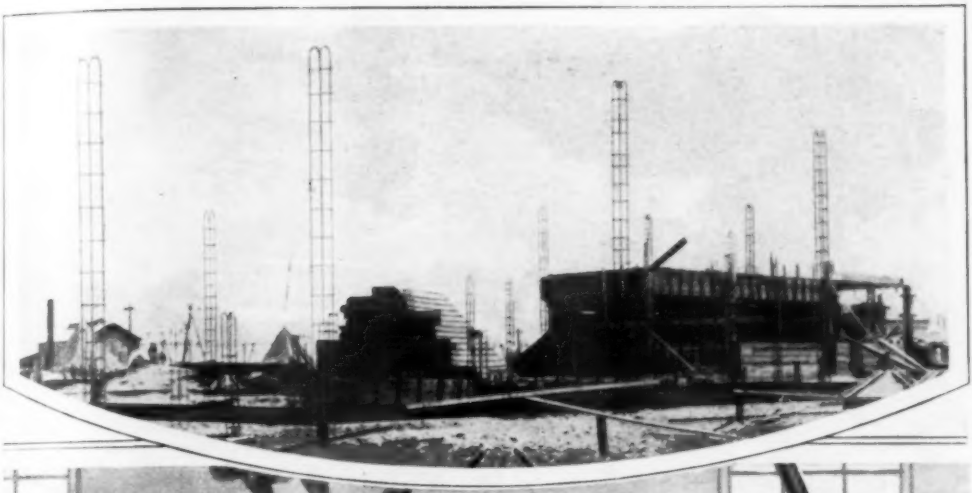
Economists and British officials are confident that almost chemically pure Dead Sea potash can be thrown on the market for about half the price of the Stassfurt product. The farmer in Illinois and California will thus be enabled to buy this soil food more liberally.

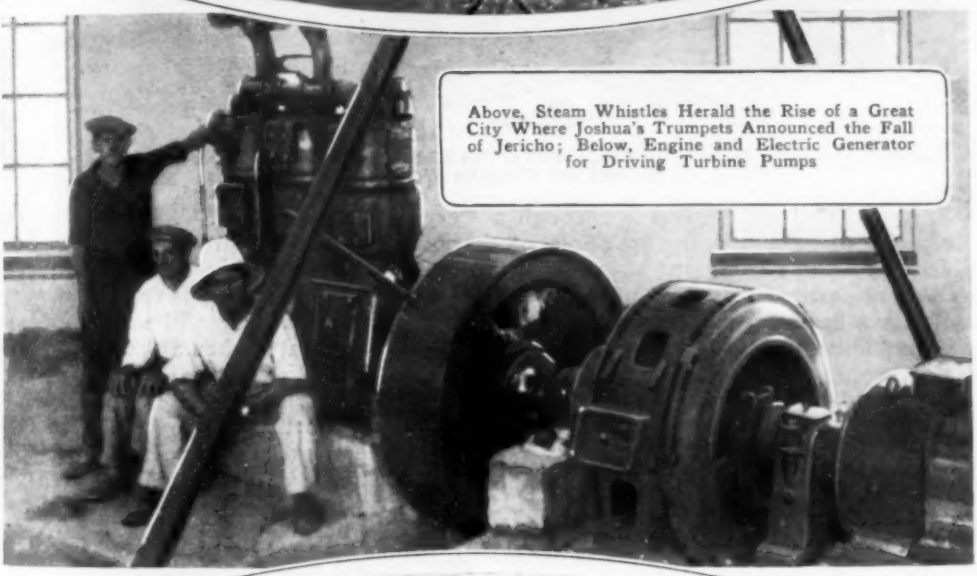
Can the Stassfurt deposits be sold as cheaply as the Dead Sea salts? Probably not. Aside from the fact that Arabs are cheaper than German labor, there is a basic difference in production methods. At Stassfurt the mining gangs swing picks and shovels about 1,500 feet below the surface. Thousands of men treat the ore in artificial solutions which purify it for the regular export trade. The mineral ore is called carnallite, and its refining necessitates smoking factories and other unsightly structures. The German investment is about $100,000,000; and 40,000 citizens gain a living from the potash mines.

But in the Holy Land—a power house 93,000,000 miles away—the sun is harnessed. Engineering talent supervises the construction of evaporation vats. A few attendants can handle the inflow and pump the liquid from one vat to another. At length, when the sun has carried off its vapors and left thick layers of glittering mineral crystals, a steam shovel will roll in on squeaking treads and sink steel teeth into the white wealth.

On the banks of the Dead Sea, the Bedouins straddle their donkeys, and behold what the great mining engineer M. A. Novomeysky has wrought! The evaporation tanks are vast and shallow, separated by narrow walls. In summer the sun skims off two-fifths of an inch of water daily, and in winter, one-fifth of an inch.

Within ten years production will be at its peak. Novomeysky's vats will cover square miles. Steam shovels will gorge themselves with potash. On finishing a





Above, Steam Whistles Herald the Rise of a Great City Where Joshua's Trumpets Announced the Fall of Jericho; Below, Engine and Electric Generator for Driving Turbine Pumps

Pipe Lines, Which Feed the Salt Pans in Extracting This Mineral from the Dead Sea and Surrounding Territory

Excavating One of the Canals in the Development of This Biblical Territory; the Project Is Expected to Make Available Minerals and Chemicals Worth Millions of Dollars

vat, fresh brine will be run in through a sluiceway, and the manufacture of marketable potash will begin.

Waters charged or saturated with solid substances have a definite order of precipitation. The sun can carry off only pure water vapor; the substances held in suspension and solution come down in orderly succession. From Dead Sea water, the order of precipitation is as follows:

First gypsum comes down. This is a white mineral, abundant all over the world, and has little export value. After gypsum comes common salt, crystallizing in cubes. In order to keep the minerals separate, the brine, now called "mother liquid," is run into a second vat, where the double salts of potassium and magnesium chloride precipitate. Magnesium sulphate comes down in the third vat. The concentrated mother liquid is next run into a special tank where bromide is extracted at a cost far below that possible at Stassfurt or American plants in Michigan and West Virginia. The bulkiest product, of course, is common salt, seven tons of it to every ton of potash. But the salt is of such purity that it can be used in the manufacture of soda ash, chlorine and hydrochloric acid. To separate the potassium chloride from the magnesium chloride, it is necessary to dissolve the carnallite crystals in hot water. When cooled, the potassium crystals precipitate first.

For the production of bromine at the Dead Sea, electrical power is necessary. An unlimited supply will soon be available at a low rate, when a new power dam on the Jordan is completed.

Aside from the potash project, the Holy Land will shortly profit by the electrification schemes of Pinhas Rutenberg, who has impounded the Jordan into irrigation reservoirs and built a series of power dams with prophetic vision. Below Lake Tiberias, the Jordan tumbles precipitously. Rutenberg has already captured the impact of this fall and transformed it into the white coal that drives motors and lights homes. Electricity has two names in the Holy Land. One is "hashmal," mentioned in Ezekiel, where "it ran and returned as the appearance of a flash of lightning." And the second name is "rutenberg." A Palestinian says to his neighbor: "I am installing rutenberg," and the neighbor knows precisely that his friend's house is being wired.

Rutenberg's concessions grant him the sole right for seventy years to exploit the river's power possibilities. When his nine projected plants are completed, power and irrigation will be so cheap that the land actually will flow with milk and honey.

BRILLIANT GREEN IS HAILED AS GERM KILLER

Wounds in surgical operations may soon be sewed with bright green catgut, which affords the greatest possible protection against infection, according to reports to the American Medical association from an investigator. Covering a wound with brilliant green, or aniline dyestuff, has been found to leave it sterile for a period of seven days. Brilliant green is not irritating, yet kills all bacteria, and is being used to wash the surgeon's hands before operations. Saturation of silkworm catgut with brilliant green increases its safety.

BURGLAR ALARM TAKES PHOTO AND SOUNDS WARNING

Germany now has a burglar alarm which not only gives light and sound signals of the intruder's presence, but takes a picture of the thief in addition. The apparatus is actuated by the photo-electric cell, or "electric eye," and is incased in a glass container, somewhat resembling the ordinary stock ticker in appearance. The electric eye is trained on the entrance to a room or the door of a safe, and the intruder's shadow cuts off a beam of light trained on the cell and causes the alarm to function, the picture being taken as the light flashes.

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Burglar Alarm Actuated by Photo-Electric Cell Which Sounds Warning and Photographs Intruder

Rocking-Chair Inclosed in a Screen; It Is Collapsible and Intended Particularly for Invalids

ROCKER INCLOSED IN SCREEN PROTECTS FROM INSECTS

For invalids who like to recline in the open, a rocking-chair inclosed in a screen now is available. It prevents insects from molesting the patient, and is collapsible so that it can be easily folded and carried about as desired.

STAR STRUCTURE LIKE AN EGG IS THEORY OF SCIENTIST

Star structure resembles that of an egg, a dense yolk in the center, surrounded by a lighter material. This is a theory advanced by E. A. Milne, mathematician at Oxford University. In the "yolk" he believes temperatures are much higher than astronomers have calculated previously, his tentative estimate being about 100,000,000,000 degrees. He also believes the nucleus is extremely dense, as great or even greater than a star like the strange companion of Sirius, a pint of whose material is estimated to weigh twenty-five tons. Professor Milne thinks the density of the interior may reach the maximum possible for ionized matter, that is, matter in which all the atoms are broken up into separate electrons. It is to this nucleus, he believes, that scientists must look for the origin of stellar energy.

FACE POWDER IS MADE FROM TALC, A ROCK, MIXED WITH TITANIUM OXIDE. ROUGE COMES FROM IRON ORE
MOST DYES HAVE THEIR ORIGIN IN SOFT COAL, ALUMINUM IS USED AS MORDANT
PUMICE IS USED IN NAIL POLISH
SILK MAY BE WEIGHTED WITH AS MUCH AS 60% TIN
SULPHUR IS USED IN RUBBER HEELS
CHROMIUM IS USED TO TAN LEATHER

Chart Showing How Modern Woman Draws on the Mineral Kingdom for Beauty Aids and Clothing

MODERN WOMAN'S BEAUTY AIDS SUPPLIED BY MINES

Modern woman is dependent on the mineral kingdom for most of her beauty aids and many articles of personal adornment. The base of face powder is talc, a soft, pearly mineral, and another powder, titanium oxide, which makes the talc stick, is likewise a mineral product. Rouge is made from hematite, a very pure iron ore, and even the mud pack of the beauty parlor is made up of a volcanic ash. The face powder may be perfumed by a synthetic scent from coal-tar products, and the dyes of her garments have the same origin, while aluminum is used to set the dye. Silk stockings may contain as much as sixty per cent of tin to give them weight and chromium is used to tan the leather for her shoes and sulphur in making the rubber heels.

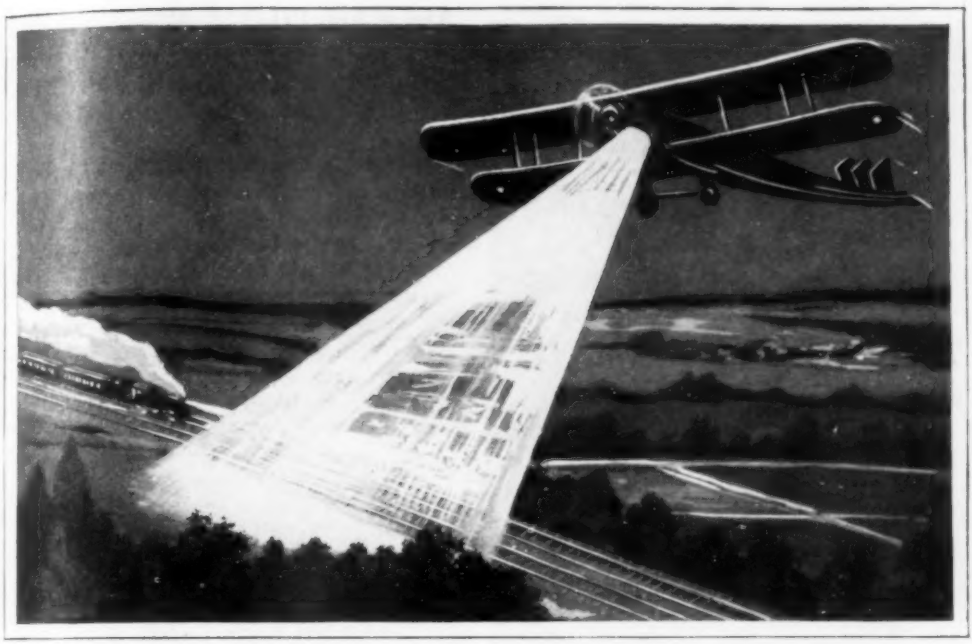
TEMPERATURE FOUND TO VARY WITH SOLAR CHANGES

Close relation between changes in the sun's radiation and in temperature offers promise for weather forecasting nearly a week in advance, in the opinion of Dr. C. G. Abbot, secretary of the Smithsonian Institution. Observations over a period of years have shown that the sun does not always radiate the same amount of heat, it varying from day to day even after allowances are made for the effect of the earth's atmosphere. Studies of temperature variations in connection with sun changes have shown that the temperature changes as the sun radiation changes, the temperature increase or decrease continuing at least four days after the maximum or minimum of radiation. A change in radiation of eight-tenths of one per cent is accompanied by a temperature change of about five degrees. A curious feature of the observations has been that an increase in radiation is not always accompanied by an increase in temperature, or vice versa. From mid-November to March, and also in May, increases in temperature and radiation usually go together, while in April, and from June to mid-November, the temperature usually goes down when radiation goes up. This leads to the possibility that the effect of the sun's heat is not felt directly on the earth, but that there is some intermediate atmosphere not yet understood. This offers one of the difficulties in predicting weather from solar variations, and another is that the changes in temperature are not the same for different places.

SUNSHINE ROOF FOR THE AUTO ADMITS LIGHT AND AIR

To satisfy the Englishman's desire for sunshine, light and air, a British automobile is being made with a sliding top known as a sunshine roof. The top slides either forward or back to let the sun fall on occupants of front or rear seats. It also permits a better view of the scenery, particularly in the mountains, when touring.

English Car with Sunshine Roof: Top Panels Slide Forward or Backward to Admit Sunlight

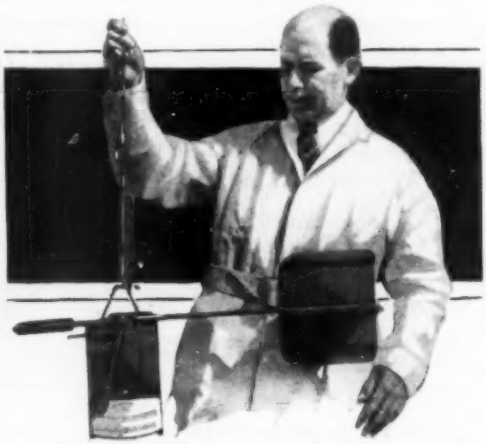


Courtesy The London Daily News

Disabled Plane Signaling with Its Searchlight to Stop a Train Which Will Pick Up the Ship's Cargo; by This Method a Pilot Recently Stopped a Train Approaching a Burning Trestle

AIRPLANE SEARCHLIGHTS HALT TRAINS IN EMERGENCIES

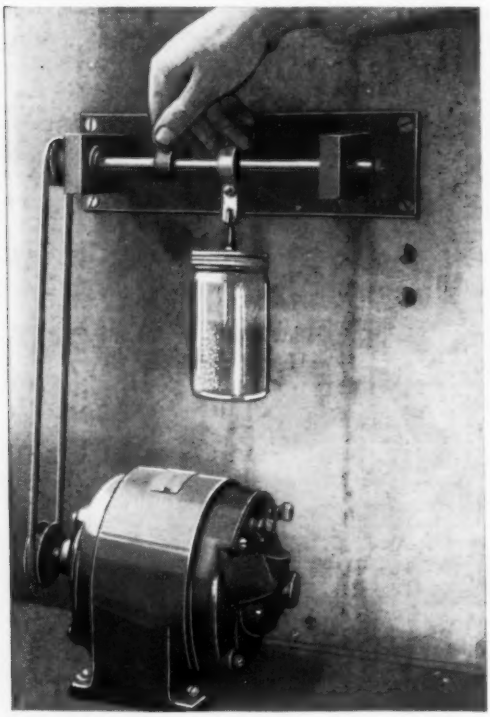
Air liners of the trans-European and Australian air services are being equipped with powerful searchlights for the purpose of signaling and halting express trains and transferring passengers and mail when the airplane is threatened with an accident or delay through mechanical difficulties. Some of these searchlights have half a million candlepower and are used for observation at night as well as for signaling. When the pilot encounters difficulties while following the railroad express lines, he signals to a train that he is about to land, and the train stops for the transfer of his load. The plan is intended to assure connections with ocean liners for mail and passengers. The signal system from plane to train recently averted a serious railroad accident in this country.



A Scale Which Weighs Air, Recording the Force of Air Currents as an Aid to Aviators

AIR CURRENT'S FORCE WEIGHED AS AN AID TO FLYERS

One of the important instruments which aids the aviator is a device for weighing air currents which is used at a school of aeronautics in California. The scale that weighs air looks like a weather vane and measures the strength of updrafts as well as wind direction. Supported high in the air by a box kite, it registers on a numbered dial the force of rising currents, and is read from the ground with the aid of field glasses.



Subjecting a Self-Lubricating Bearing to Friction by a Weight of Shot in a Glass Jar

A SELF-LUBRICATING BEARING USES CHEMICALS FOR OIL

Self-lubricating bearings recently have been made with chemicals incorporated in the metal to answer the purposes of oil. The bearing is made by combining one or more metallic powders with one or more materials yielding a soapy substance. The ingredients are placed in a cold mold and subjected to a pressure of 40,000 pounds per square inch, the temperature being raised gradually to 400 degrees. After keeping the mold at this temperature for half an hour, the pressure is raised to 200,000 pounds per square inch. Then the pressure is released and the mold is allowed to cool. The bearing was developed after it was found impossible to incorporate in an oil the minerals that would reduce friction under load.

AIR MAIL PILOTS' MONTHLY PAY OVER FIVE HUNDRED DOLLARS

During the last six months of 1929 and the first six months of this year, air-mail and passenger pilots received an average monthly pay of $550, according to figures gathered by the aeronautics branch of the department of commerce. Airplane and engine mechanics received an average monthly salary of $157 during the same period. Pilots are awarded a base pay of less than $200 on the average, but they receive in addition, five cents a mile for day and ten cents a mile for night flying under the usual contracts with operators. The highest monthly salary was $850 where extensive flying was done at night. The lowest pilot's wage was $300 a month, while the lowest salary to mechanics was $125 and the highest $185.

BIG LOUD SPEAKER ON WHEELS HEARD FOR FOUR MILES

As a modern successor to the old circus calliope, two Los Angeles brothers have constructed a huge loud speaker on a truck, having an audibility range of four miles. It is in reality a miniature broadcasting studio, the truck containing a power generator, electric amplifier and control, air-compressing unit and an enormous horn. The volume can be regulated to send out a whisper or a four-mile shout. The air compressor is used with a giant mechanical larynx operated with the horn. The "symphony chariot" is to be employed for advertising, public addresses and broadcasting dance music.

Loud Speaker with a Four-Mile Voice Mounted on a Truck; the Truck Actually Constitutes a Complete Broadcasting Station

LINDBERGH PICKS *a* PLANE

"HOW'S your heat running?" the passenger in the rear asked Col. Charles A. Lindbergh, his words easily audible beneath the two transparent coverings that had been designed to make the open cockpits of his latest airplane habitable in freezing gales of the upper atmosphere.

"Heat's O. K." said the colonel. "The motor picked up fifteen revolutions. We're doing about two miles an hour more."

Just previously the two experimenters—Colonel Lindbergh and R. O. Pecht, of whose abilities Lindbergh thought so highly he had him inspect and service his powerful low-wing monoplane before making a record-breaking transcontinental flight some time ago—had removed part of the cowling around the engine cylinders.

They had slipped on a new design, curved metal intended to control the flow of air and add several miles an hour to the plane's speed. Each change they made was important as far as heat was concerned, for Lindbergh was seeking a combination that would enable the plane to fly very fast and at the same time keep the engine temperature within a moderate range.

At the moment Lindbergh was the scientist, trying new combinations of curves better to streamline and cool his powerful motor. Soon thereafter he was to fly with his wife across the continent, seeking favorable air currents and studying the engine and streamline characteristics of his plane, looking forward to the time when commercial planes will carry passengers between Atlantic and Pacific in ten or twelve hours.

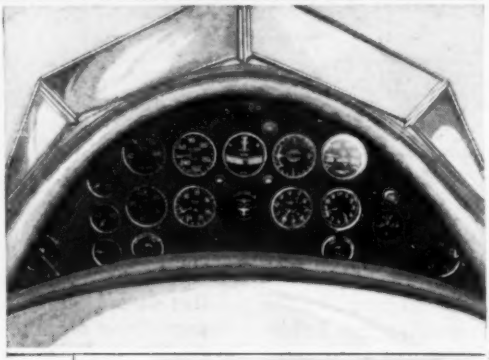
But why was he so concerned with the heat of the engine? And how did he measure that heat? Airplanes can fly safely only so long as the motors sing their songs of safety high above mountains and deserts. If an engine overheats, soon the oil "breaks down," metal parts "freeze," the propeller stops and down comes plane and passengers.

So Colonel Lindbergh while flying in the vicinity of Burbank, Calif., watched each variation of temperature not only in the lubrication oil but also within each cylinder. He had on his instrument board every known device to report conditions in each part of the engine. He knew how hot each cylinder head was and how hot the terrific explosions made its base.

This was only one of many tests Lindbergh made to determine whether the low-wing Lockheed with a Wasp 425-horsepower engine was the one he wanted. He was selecting an airplane that would combine the qualities of high speed (to save time) and low landing speed (for safety),

in which he could make important long test flights whose results he hoped would further the development of passenger air transportation.

During approximately thirty-five tests, Lindbergh dove the plane at high speeds; climbed and stalled, letting the plane recover without any help from him; opened the engine wide and raced over a measured course to determine the plane would fly 177 miles an hour; studied fuel consumption at various speeds, and finally determined how slowly the plane could fly without "falling off" on one wing or the other.



Colonel Lindbergh Closing the Coupe Top He Designed; the Instrument Board of His Plane, and Installing the Engine

The plane was built to meet Lindbergh's demands for many qualities; its colors—black and orange—were selected by Mrs. Lindbergh, and the Lindberghs jointly named it "Sirius" for the Dog Star, the brightest star in the heavens.

"Colonel Lindbergh wanted a low-wing type plane," said Pecht after one of their engineering flights. "He also wanted two open cockpits. He required that the plane be able to land slowly, get off with a heavy load, be easy on the controls and have good vision from both cockpits.

"He wanted a low-wing plane, because that is his idea of the next trend in airplane design. The low wing offers safety not only to the pilots, but also protects the passengers in larger models. You can see why. In case of a forced descent, first the wheels will absorb the force of the impact, then the landing gear and finally the wing will protect the fuselage.

Soon after Colonel Lindbergh inspected his new plane he engineered an innovation in sliding cockpit covers. These are called coupe tops and are adjustable. The tops, when the cockpits are open, are located along the top of the fuselage between the cockpits. To close, the pilot and passenger need only pull the tops in place, and they have all the comfort of a closed airplane. Ventilators on each side of the fuselage in the forward cockpit enable the occupant to control the heat within. The sliding tops allow the flyers to look forward and out over the side of the plane.

On one test flight, Colonel Lindbergh took off, climbed up to 2,000 feet and then closed the top. He set the throttle, then took his hands and feet off the controls. He talked with his fellow experimenter

nearly ten minutes while the plane flew itself. So easily did it take care of itself that Lindbergh a little later put the ship into a dive, then released the controls. The plane righted itself and soon was flying level again.

"Fortunately," said Pecht, "Colonel Lindbergh knew what he wanted before the plane was built. With his low wing he can mush into a small field and get off again with only a short run. The plane will leave the ground with a speed of sixty to sixty-five miles an hour. I have seen it leave the earth at the end of a 400-foot run with a light load. It lands at fifty miles an hour and with brakes on the wheels can stop in 300 feet after it settles."

Three elements in Lindbergh's plane combine to push up the speed from 100 miles an hour, thought a few years ago fast even for an airplane, to nearly 200. Of course, he employs a more powerful engine than was common five years ago. Plane and engine are streamlined to reduce resistance and smooth out the flow of air past the engine, fuselage and landing gear; and the plane is covered with a smooth skin of wood.

Colonel Lindbergh's experiments with the plane resulted in several adjustments and changes that made the plane both more efficient and faster. With the cowling alone, his suggestions made it possible to get rid of thirty pounds of weight. He made all his tests several times, remaining aloft each time long enough to obtain steady readings of temperatures and to check earlier observations that might have been based on chance. Colonel Lindbergh had built in the wings and fuselage tanks to carry 440 gallons of fuel and twenty-eight gallons of oil. The plane measures forty-two feet ten inches between wing tips. Without further change, the "Sirius" easily could fly the course from New York to Paris that first brought fame to the "Lone Eagle."

DIVER CONVERSES WITH FLYER FROM OCEAN FLOOR

Thousands of radio fans recently were able to tune in on a two-way conversation between a diver standing on the bottom of the Pacific off the coast of Los Angeles and an aviator flying above the ocean. The diver described to the pilot the floor of the ocean, while the pilot discoursed on the beauties of the air. Amplifiers were placed on a yacht that was cruising in the neighborhood and the conversation was transmitted to the listeners over a nation-wide broadcasting system.

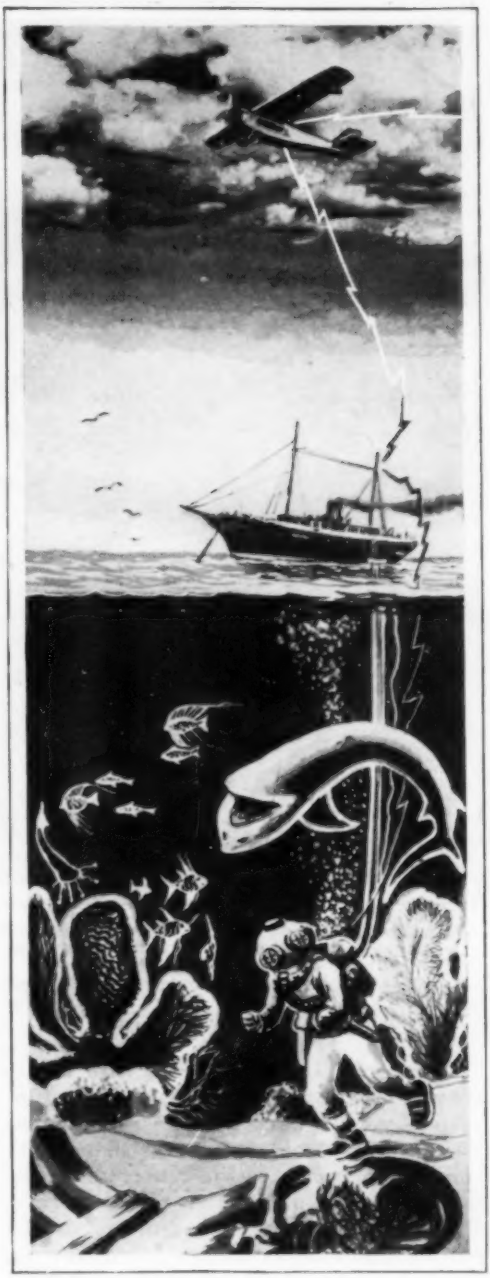
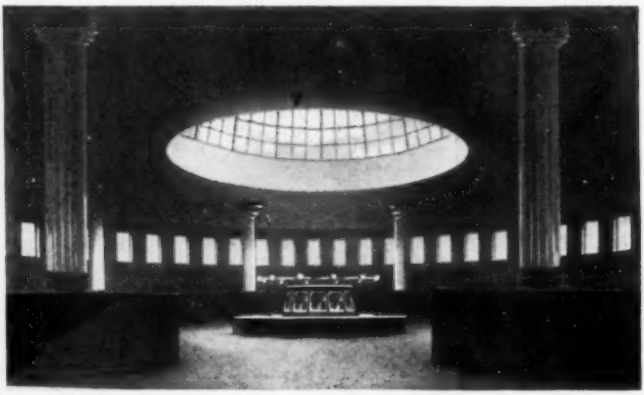


Diagram Showing How Diver Talked by Radio to Aviator, the Ship Broadcasting the Conversation



Above, Sorting Table in Munich's Mechanical Post Office, and, Below, Turbinelike Conveyors That Carry Packages to the Proper Trucks

POSTAL WORK IS SPEEDED UP BY TURBINE SORTER

Germany is experimenting with a mechanical post office in Munich which automatically does much of the work of sorting parcels. It is circular in shape with sorting equipment in the center and loading apparatus about the circumference. Packages are carried on trolleys to the entrance of a sorter shaped like a turbine. They are then stamped and tossed into openings corresponding to addresses. Slides and endless belts then convey the parcels to the proper loading platforms.

¶Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information.

INSURANCE PLAN FOR AVIATORS AIDS CLUBS

Instruction and solo practice for persons learning to fly, who do not have their own planes, are available through a flying-club plan evolved by the National Aeronautic association. Under this arrangement, from ten to thirty persons unite to purchase a plane and obtain the services of a competent pilot instructor. Each member's share of the cost ranges from $125 to $500, depending upon the kind of plane purchased and the number in the club. The association issues an insurance policy to cover liability and compensation in case of accidents. All damages beyond the first $300 are covered even if a training plane is completely destroyed, in which case the price of a new one is paid. The association also takes precautions to insure the safety of the club members and the hiring of competent instructors. Clubs participating in the plan furnish reports of their activities every two months. At the end of the year, the association awards a cup to the club having the best record.

INSECTS HELP SAVE NUT CROP

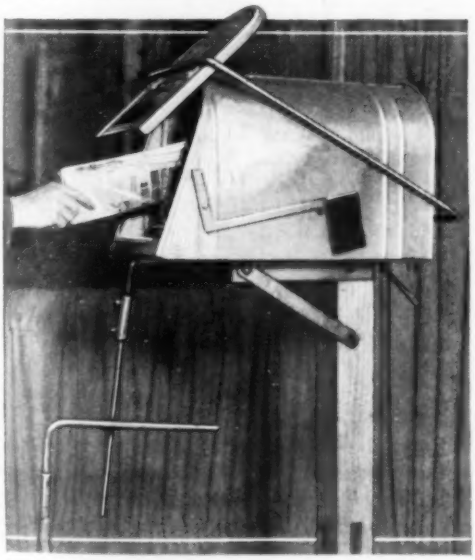
To save the pecan crop, the department of agriculture has enlisted the services of a tiny insect parasite that produces multiple sets of twins inside the eggs of other insects. This little ally, which goes under the imposing name of trichogramma minutum, has been reared in a government laboratory in Texas. When full-grown, the parasites are released in the pecan orchards of the south and prey on a borer which damages the pecans.

CANNED FRUIT KEEPS COLOR BETTER IN COLD STORAGE

Certain canned fruits have better natural color when kept in cold storage, British investigators declare. Canned strawberries, kept at a temperature just above freezing for three months, had a fine red color, whereas those stored in ordinary room temperatures or in extreme cold, such as ten degrees below zero Fahrenheit, are pale. The berries kept at slightly above freezing had an even better color than when they were first canned, as they had absorbed color from the sirup.

AUTOMATIC RURAL LETTER BOX SAVES TIME OF MAIL MAN

To save the time of the rural mail carrier, an automatic letter box, which opens and closes without being touched by him, is coming into use. An upright metal rod attached to the running board of the carrier's automobile engages another rod suspended from the box when the car is driven to the side of the road near the box. Through a series of levers, the rod attached to the mail box raises the cover. As the car proceeds, the mail-box rod is pushed over and this releases the lid, causing it to fall back into place, at the same time raising a red flag to signify that the box contains mail.



Automatic Letter Box Which Opens When Rod on the Mail Man's Car Strikes Rod on the Box

Dry-Shaving a Sheepskin in Making Parchment; the Process Is the Same as Was Used Centuries Ago

TOOLS A THOUSAND YEARS OLD STILL MAKE PARCHMENT

About eight miles from Portsmouth, England, parchment is being made by the same methods and with the same tools that were used 1,000 years ago on the same site. One of the most laborious and most delicate tasks is dry-shaving the sheepskin. After the skin has dried, it is necessary to shave it to remove all roughness. For this purpose, a semicircular "razor" with double handles is used.

FALLS HIGHER THAN NIAGARA FOUND IN AFRICA

Waterfalls, probably never before seen by a white man and little known to natives, have been discovered in South Africa on the Chunga river, which empties into the Zambesi. One of them is thirty-three feet higher than Niagara. It is one of a series that make a total drop of 334 feet. Farquhar B. Macrae, of the Northern Rhodesian civil service, who found them, reports that they dash down between towering precipices of basalt several hundred feet in height, giving an impression of greater altitude than the Victoria falls.

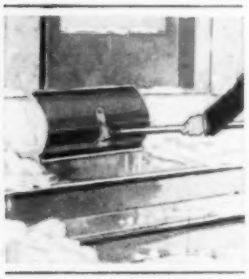
Generating Heat Estimated at 900,000 Degrees Fahrenheit by an Electric Arc in a Vacuum

THE HOTTEST SPOT ON EARTH RIVALS THE SUN

While investigating the characteristics of electric arcs in a vacuum, a spot of heat estimated at 900,000 degrees Fahrenheit was created by a Westinghouse electrical laboratories engineer. This man-made heat, ninety times that of the sun, was formed by electricity in a nearly perfect vacuum.

SNOW SHOVEL AND SQUEEGEE COMBINED IN ONE TOOL

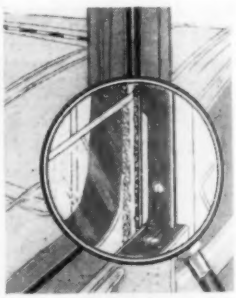
By altering the position and angle of the handle, a metal snow shovel may be changed at will into an ordinary shovel or into a squeegee. One side of the tool contains a rubber edge to be used as a squeegee for removing slush, water and snow from porches or any painted or finished surface without marring it. By adjusting the handle, the tool can be transformed quickly into an ordinary hand snowplow for cleaning walks, or into a shovel for dumping the snow.



SINGING PIANO WIRE RECORDS MOTOR-SHAFT TWIST

Singing piano wires have been employed successfully to measure the torsion exerted on the huge steel motor shafts of powerful rotating machinery. Such a wire was given its first real test on the propelling shafts of the big German liner "Bremen." Although the shafts of a great liner are designed to carry the thousands of horsepower thrusts which drive the vessel forward, they twist a minute fraction of an inch in actual use because no metal is absolutely rigid, but shifts under strain. Engineers must be able to calculate these twists or determine them experimentally. The singing wire allows them to measure the smallest angular vibrations and trace them to their source. The stretched wire is kept vibrating by an electromagnetic device, the tone of the wire attached to the shaft being compared with that of another wire stretched to a known degree. As any twist of the shaft tightens or loosens the wire attached to it, and thus alters the tone, the engineers are able to calculate the twist.

CAR-WINDOW RATTLE STOPPED BY CHANNEL FASTENER

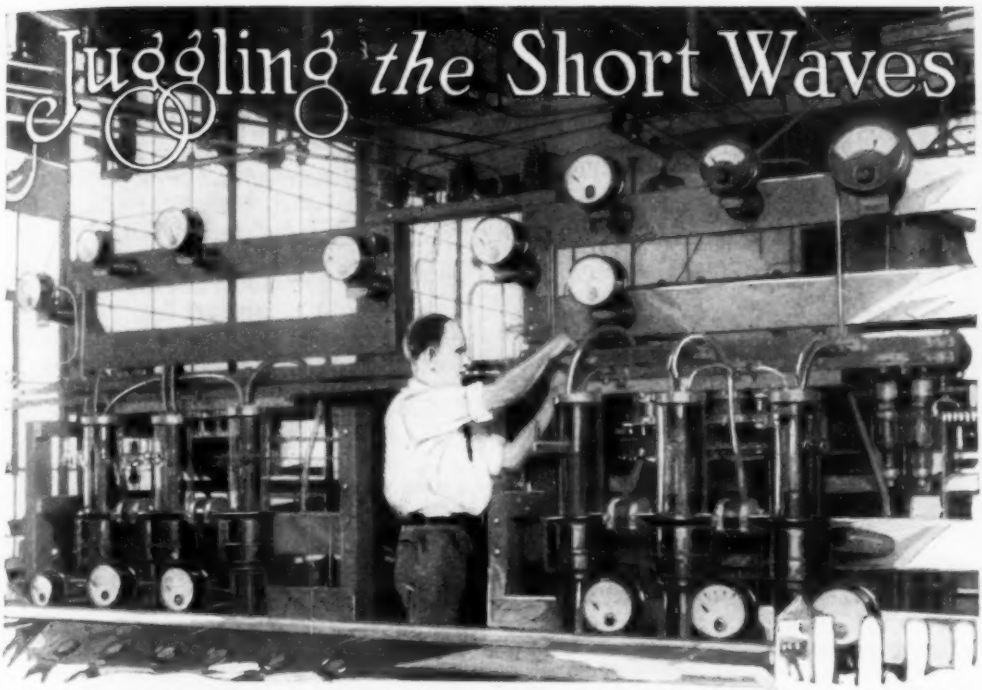


Rattles and noises in auto windows may be stopped easily with a small tin fastener which is quickly inserted in the window channel. The window is lowered and the anti-noise appliance is slipped in the channel between the glass and the felt. When the window is raised, the fastener is pushed in its place in the channel.

PARIS AUTO SUBWAY STARTED

Paris has started construction of an automobile subway which will run under the Avenue Foch, and will accommodate all the traffic which now cuts across this avenue at the Porte Dauphine. This gives autoists a clear run at this intersection.

Juggling the Short Waves



Where Time and Space Are Being Bridged by the Magic of Wireless; Interior of Big Broadcasting Station Where Short-Wave Messages Are Flashed around the World and Back

By DON GLASSMAN

LISTENING in one morning, I heard a yawn stretching from Australia to Schenectady, N. Y. That was P. M. Farmer, engineer of VK2ME, at Sydney, yawning on a wavelength of 31.48 meters.

"What time is it?" he asked.

"Bright and early," returned W2XAF from Schenectady. "The sun is high. Dew on the grass. We just came through a cold spell."

The two-way communication between Schenectady and Australia might have continued all morning, were it not for the fact that Mr. Farmer wished to sign off and retire for the Australian evening.

When, in a casual way, the engineers of W2XAF announce they are about to open conversation with Australia, doubt comes over you. Some vacuum tube will blow out, or there will be too much static, you say to yourself.

"Are you ready?" comes a sudden voice. "Sydney, Australia, is waiting. Mr. Farmer talking!"

First like an echo, then like the squawk of a foghorn, then like a real voice, as Mr. Farmer seems to clear his throat and talks in a very matter-of-fact way about the weather.

VK2ME is 10,000 miles from Schenectady on an airline. The circumference of the earth is about 25,000 miles. Now, if my conversation had reached Mr. Farmer by the front door, that is, across North America and the Pacific, it must have traveled about 10,000 miles; but if it entered via the back door, across the Atlantic and Africa, it traveled 15,000 miles. How long does it take a radio wave to travel the 5,000-mile difference between the two doors? Surely a tiny fraction of a second, because radio streaks around the equator seven and one-half times a second.

In answer to the inquiry about which route radio waves take between Schenectady and Sydney, engineers can only shake their heads or answer: "Probably the signals travel in both directions and make a complete circuit of the globe." If that is true, then VK2ME receives a repeated signal from Schenectady; but the second one arrives so soon after the first that the two are almost perfectly synchronized. And, no doubt, the repetition of the same

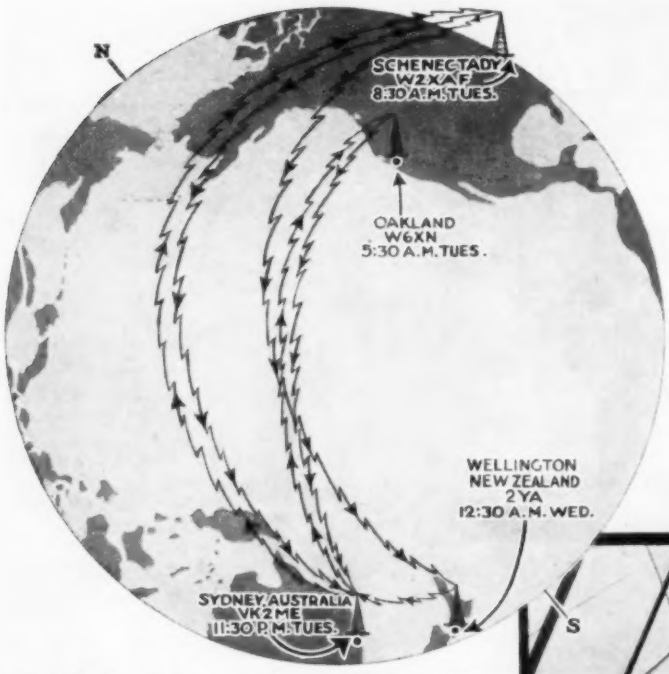


Chart Showing Location of Important Stations That Have Made Long Broadcasts, and Looking up 300-Foot Radio Tower

signal probably makes for stronger reception.

Having thrown speech 10,000 or 15,000 miles into the ether on radio waves that bound 186,000 miles per second, the amplitude of their jumps being about 100 feet, I believed I had heard and seen the most recent stunt in short-wave juggling. But not so. Broadcasting art advances so rapidly that only a few weeks before, the two-way conversation circuit became history and the four-way circuit became a definite achievement.

In northern New York lies Schenectady. It is dawn at W6XN Oakland, while A. S. MacDonald and P. M. Farmer are donned in tropical outfits at their Sydney station, VK2ME, and are about to hear the midnight curfew.

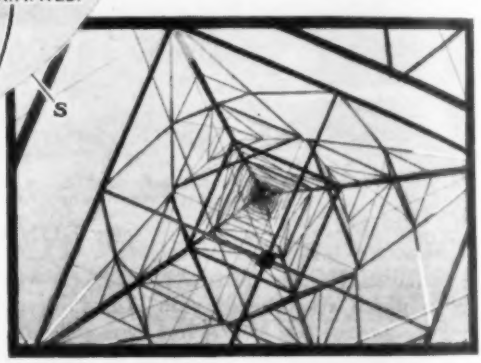
The key stations VK2ME, Sydney, on 28.8 meters, and W2XAF, Schenectady, on 31.48, opened the conversation. Then 2YA, at Wellington, New Zealand, detected their far-flung speech and joined the circuit. The last to come in was W6XN, at Oakland. Four sets of transmitters and receivers in harmonious communication!

W2XAF spoke up: "The sun has been up two hours here."

"The sun," responded W6XN, "won't rise in California for another hour."

"It's late; about 11:30 o'clock," remarked Sydney. "Many folks are down at the beach enjoying surf bathing and trying to find relief from the oppressive humidity of a midsummer's night."

So many voices and circuits took the air that once Schenectady talked to Australia, thinking he



was addressing Oakland. Australia answered, while Oakland laughed.

Meanwhile, Sydney became anxious to have the mother country on the circuit and make it a five-party line. Schenectady heard Sydney calling London. And London threw out frantic signals with all available power. Like so many scratching phonograph needles, the waves etched strange noises on receiving mechanisms. Only a few sounds filtered through.

Hanging on the thinnest threads of precision and balance, the four-way circuit was constantly in danger of disruption. Once Oakland reported to Sydney that it could no longer hear Schenectady. Then ingenious minds met, even though physically separated by thousands of miles. Sydney radioed Oakland that Schenectady was still on the air.

"You'll hear Schenectady in a few minutes if you'll stand by. We're going to rebroadcast Schenectady from Sydney!"

That sounded preposterous even to Schenectady, where impossible is a forgotten word. Sydney was going to pick up a 10,000-mile broadcast and return it almost over the identical route over which it had come. A single circuit greater than any possible broadcast around the globe, and measuring no less than 17,000 miles. Once across the North American continent and twice across the Pacific ocean to receive a signal originating only 3,000 miles away. It worked.

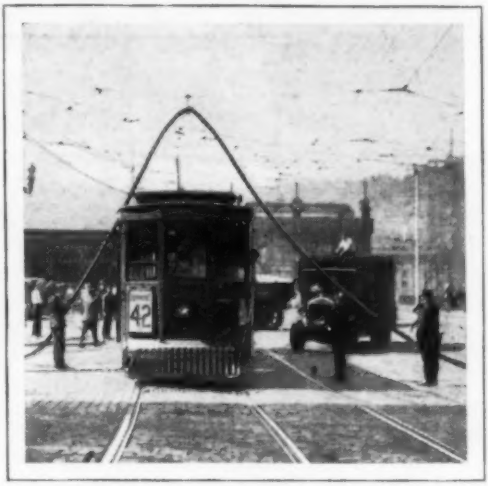
OLD METAL ROOF RADIOACTIVE

Pieces of old copper, lead or zinc roofs have been found to possess marked radioactivity, emitting radiations like radium does. It is thought that continued action of the sun's rays for fifty or one hundred years causes a partial disintegration of the metal which then shows radioactive properties.

BATTLESHIP BUILT FOR MOVIES RESTS ON A SCOW

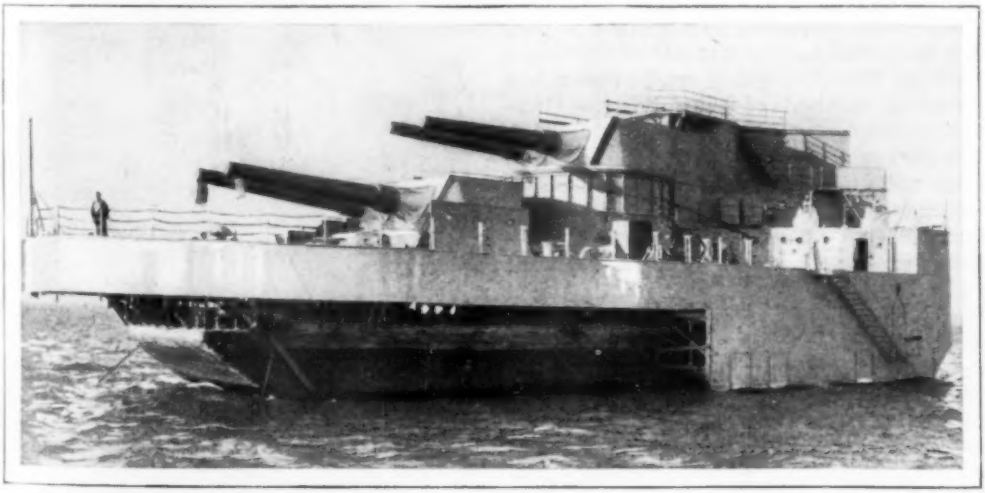
In the Los Angeles harbor is a curious-appearing craft, its lower part resembling a rather dilapidated scow, and the upper part a modern battleship. It is a battleship built for the movies, the scow providing the hull. Of course, the eye of the camera will see only the graceful lines of the warship, the scow being carefully concealed when the "shots" are taken.

FIRE HOSE LIFTED OVER WIRES ENDS TROLLEY DELAY

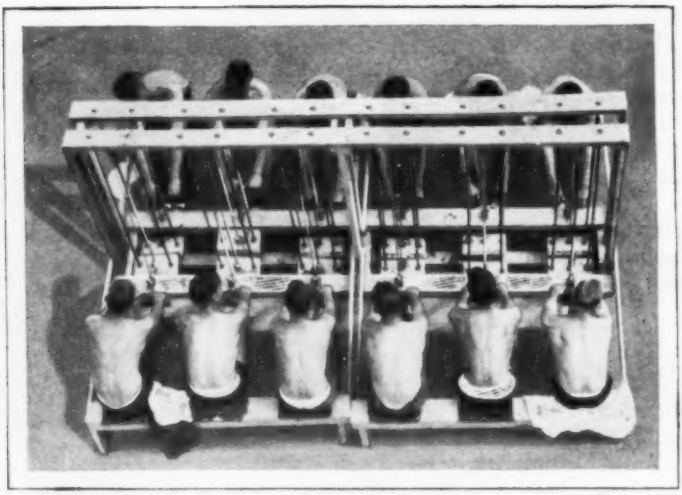


Fire Hose Strung over Trolley Wires, Thus Allowing Traffic to Proceed during Fires

Through the new method of fighting blazes along heavily trafficked thoroughfares adopted by the Pittsburgh fire department it now is possible for street cars and other vehicles to proceed without interruption. This end is achieved by stringing the hose lines over the trolley wires in the middle of the street, thus keeping them off the pavement and allowing traffic to keep on moving almost as rapidly as under ordinary conditions of the street.



This Combination of Old-Fashioned River Scow and Modern Battleship Is a Moving-Picture Warship; the Movie Camera Will Show Only the Graceful Lines of the Fighting Ship



Rowing Machine on the Deck of a Battleship, Where the Racing Crew Keeps in Condition When Unable to Take to the Water

RACING MACHINE ON WARSHIP KEEPS ROWING CREW FIT

To keep the race-boat crew of the U.S.S. "Arkansas" in prime condition while at sea and unable to practice in rough water, a rowing machine has been rigged up on the deck. The apparatus somewhat resembles the exercising equipment that keeps the business man fit, except that it is set up in multiple units so that the entire crew can practice in unison.

CRACKING OF CONCRETE POSTS ENDED BY REINFORCING

Concrete posts that do not crack as they are subjected to climatic and temperature changes now are being made through a patented method of reinforcing. Ordinarily concrete material shrinks as it dries, but the metal cage of reinforcing material does not undergo this shrinkage process, and hence the post cracks in many places and eventually disintegrates. The weatherproof post contains one centrally placed rod instead of a cage. This rod is coated with oil or liquid asphalt to prevent the adherence of the concrete to the steel during the setting process. After the concrete has set and dried, the rod is screwed tight by means of a nut and washer on its extended, threaded end. After the tightening process, the post has its steel in tension and its concrete in compression, thus preventing cracking.

GREEN COLOR MOST ATTRACTIVE TO INSECTS

Green traps proved more effective than those painted any other color in tests by the department of agriculture to determine if insects have color preferences. Forty-four Japanese beetle traps were baited similarly and rotated to give each an equal chance to lure beetles. Ten colors were used, four traps being painted with each color while four were left unpainted. The green traps attracted the most insects, and next in order came brown, yellow, red, blue, orange, unpainted, white, indigo, black and purple.

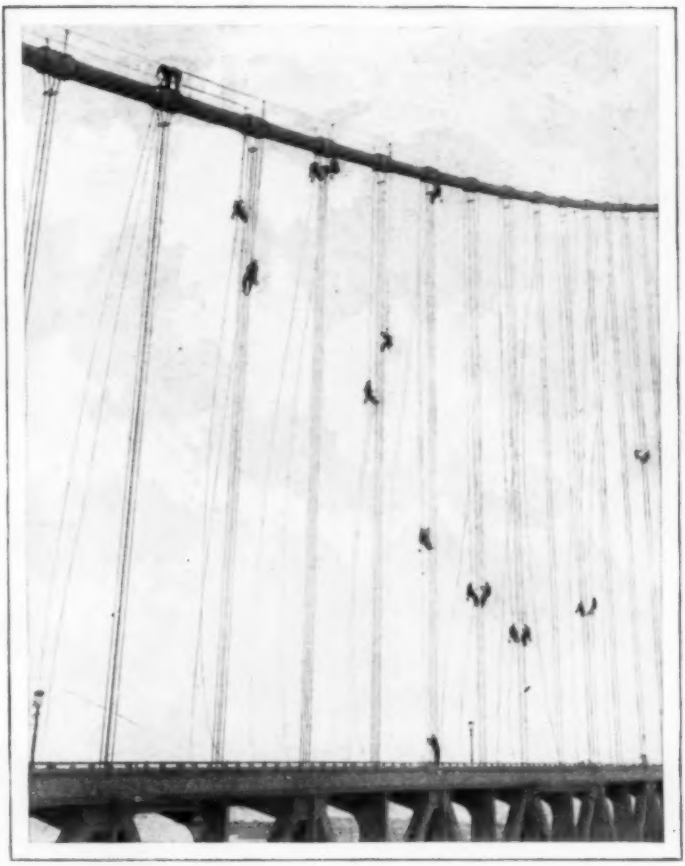
TWENTY-TWO POUND MOTOR FLIES GLIDER

Weighing but twenty-two pounds and developing ten horsepower, a lightweight motor for propelling gliders has been built by a Californian. The engine develops its maximum energy at 6,000 revolutions, turning the propeller 1,560 revolutions.

Ten-Horsepower Motor, Weighing Twenty-Two Pounds, Which Is Used to Propel a Glider

HAVE YOU RADIUM IN YOUR BACK YARD?

Contrary to popular opinion, there is a simple test that reveals the presence of radium ore, one of the most precious of metals, and present in minute amount in the earth much more frequently than is generally believed. It usually is found in heavy pitchlike rocks. To test a sample, an ordinary photographic plate or film is wrapped in dark paper, care being taken not to expose it to the light. A key is placed on this package and on top of the key the rock suspected of containing radium is laid. After several days the plate is developed in the dark room, and if the specimen contains radium, the picture of the key will appear on the plate. The richest radium deposits have been found in the Belgian Congo, where four tons of ore yields one gram of radium, or one twenty-eighth of an ounce, valued at $70,000. Utah ore yields about one gram from seventy tons.



These Are Not Lilliputians Snared in a Giant Spiderweb, but a Crew of Workmen Engaged in Painting the Delaware River Bridge

PAINTERS ON BRIDGE CABLES LIKE HUMAN FLIES

When workmen recently started giving the Delaware river bridge between Philadelphia and Camden, N. J., a new coat of paint, opportunity was afforded for an unusual picture of the operation. A photograph of the paint crew, taken at a distance, revealed the men on the cables in the likeness of human flies in a giant spiderweb of symmetrical shape.

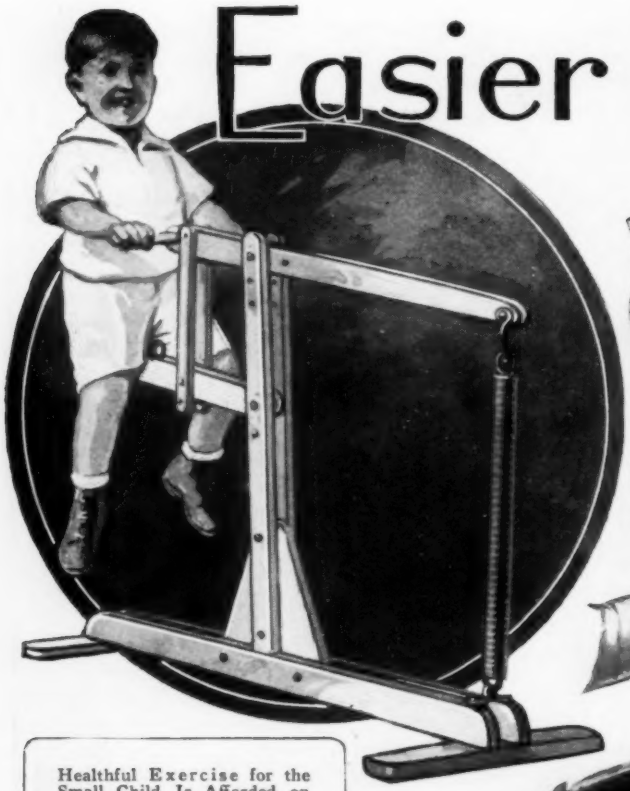
AUTOMATIC LAMP FOR BEDSIDE LIGHTS WHEN TIPPED

Intended for use at the bedside, an automatic electric lamp lights when it is picked up and tipped sidewise, and turns off automatically when set down on its weighted base. It contains an amber bulb and is of particular value in telling the time at night. Several colors and finishes are obtainable, to harmonize with other furnishings in the house.

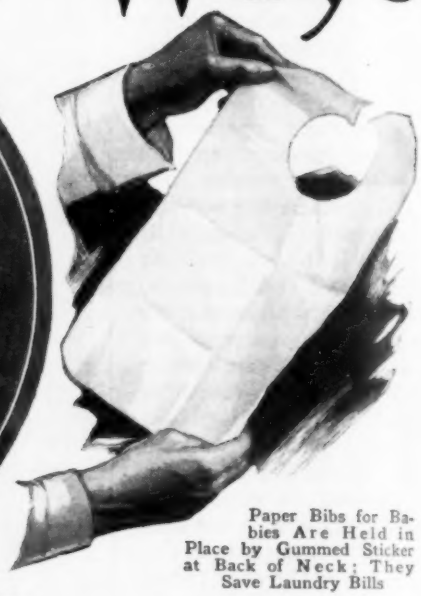
THEFT-PROOF APPLE IS BITTER

Theft-proof apples are the latest goal of horticulturists. A member of South Dakota state college believes he has developed an apple that small boys will not steal. It is called the "Hopa," and is intended primarily for jelly making. In its natural state it has a very bitter taste.

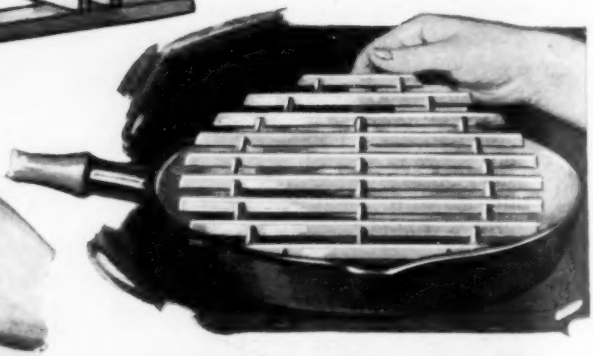
Easier Ways



Healthful Exercise for the Small Child Is Afforded on This Jumper Which Operates like a Teeter-Totter; the Heavy Coil Spring Controls the Motion; Seat and Spring Are Adjustable

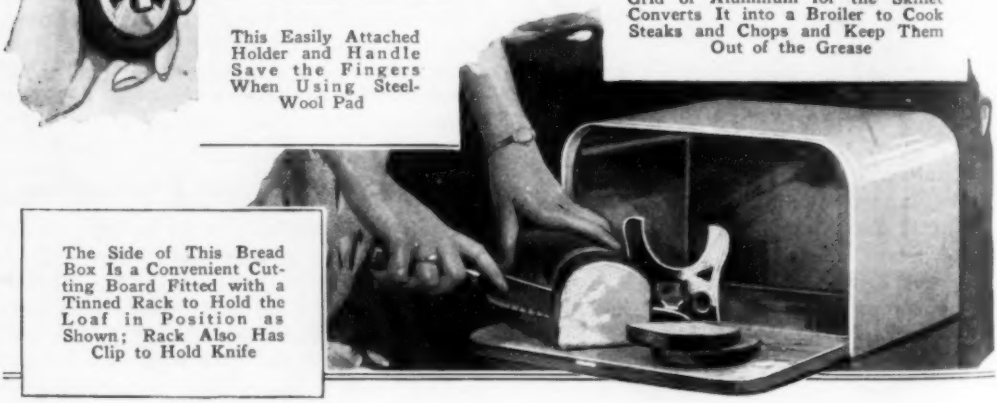


Paper Bibs for Babies Are Held in Place by Gummed Sticker at Back of Neck; They Save Laundry Bills



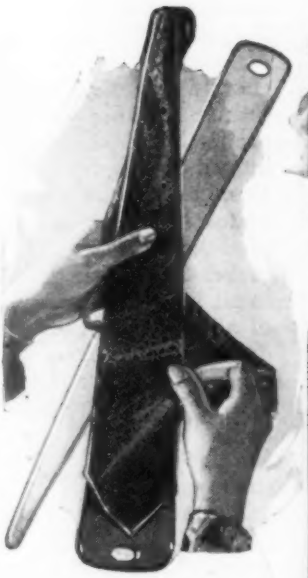
Grid of Aluminum for the Skillet Converts It into a Broiler to Cook Steaks and Chops and Keep Them Out of the Grease

This Easily Attached Holder and Handle Save the Fingers When Using Steel-Wool Pad



The Side of This Bread Box Is a Convenient Cutting Board Fitted with a Tinned Rack to Hold the Loaf in Position as Shown; Rack Also Has Clip to Hold Knife

# of Doing It



Neckties Are Quickly Pressed with This Form, Which Is Moistened and Slipped inside Tie for a Few Moments to Take Out Wrinkles

Portable Heater Warms and Circulates Air by Electricity; Built-In Model Using Steam or Hot Water Shown in Inset; Fan Alone May Be Used for Cooling

Bag Above Contains Substances That Produce Heat When Small Quantity of Water Is Added; Used as Substitute for Hot-Water Bottle and Can Be Employed Repeatedly

At Right, This Strainer Clamps on Kettle Handle So That Pouring Can Be Done without Scalding the Hands

An Aerial View of the British Warship, "Rodney," Showing Her Powerful Sixteen-Inch Guns Mounted in Triple Turrets

GIANT GUNS IN TRIPLE TURRETS ON BRITISH BATTLESHIP

England's most powerful and most modern war dog is the battleship "Rodney," which, with her sister ship, the "Nelson," is the only vessel to have sixteen-inch guns mounted in triple turrets. Despite the ponderous size of these giant weapons, they are manipulated with ease, and, due to their range of twenty miles or more, are elevated to a remarkable degree when in action.

CONCRETE LIKE "RAISED BREAD" ENLARGES AS IT HARDENS

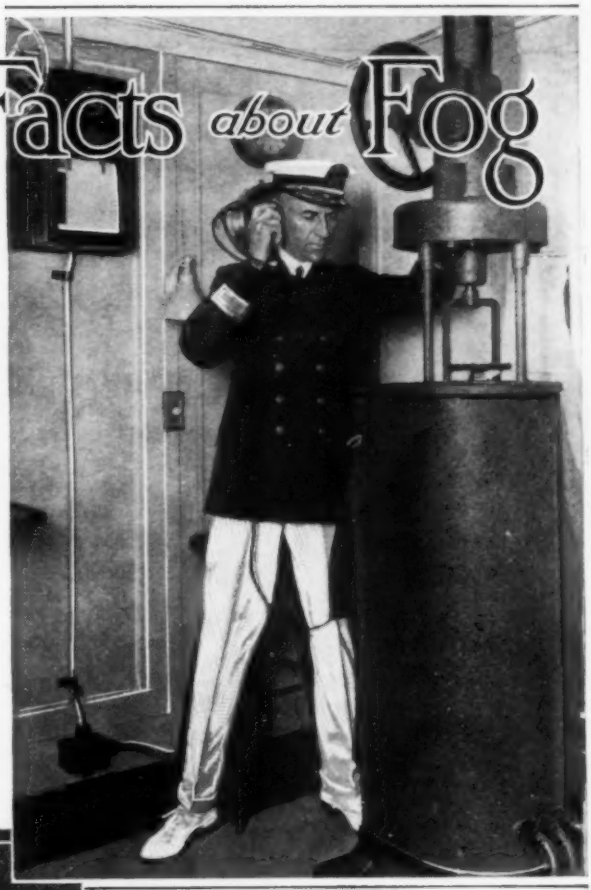
Rising, like bread, to twice its original size as it hardens, a building material said to be seventy-five per cent lighter than concrete and so hard that a weight of 370 pounds to the square inch leaves no impression, has been developed by Prof. Albin H. Beyer, of Columbia University. The material, composed primarily of cement and concrete with the addition of small quantities of lime, aluminum powder and soda, also possesses unusual fire-resisting properties. When poured in semiliquid form, the aluminum powder generates hydrogen, a layer of liquid flooring, two inches thick, rising within an hour to a thickness of about five inches and drying as it expands. Floorings, four and one-half and ten and one-half inches thick, were used for fire tests, the under surfaces being subjected to temperatures ranging from 1,700 to 1,900 degrees. After four hours, the thinner flooring's upper-surface temperature was from 139 to 207 degrees, while the hottest point on the top of the thicker flooring showed an increase of only twelve degrees. Theoretically, in a building constructed of this material, an office staff could have worked during the entire test without noticing the destructive blaze beneath them.

THREADS INSIDE BOTTLE NECK FOR SCREW-TOP STOPPER

Glass bottles now are being made with inside threads for receiving a screw-top stopper. Such a bottle can lie on its side for hours without leakage, and there is no rust, corrosion or evaporation.

Queer Facts about Fog

By FITZHUGH TALMAN



NOWADAYS it is a dull month that does not bring us tidings of some new contrivance by which fog is said to have been "conquered." Our grandfathers had acoustic signals of a few simple types—bells, whistles, horns and sirens for the benefit of mariners, and torpedoes for use on railroads—to lessen the dangers of fog, but today we have a long list of ingenious devices meant both to protect and to facilitate travel and transport by land, sea and air in thick weather. There are submarine bells and oscillators, the radio compass and the radio beacon, automatic steering devices, beacons using special kinds of light, the leader cable for harbors and airports, sensitive altimeters for aircraft, and other things, in actual use or being developed, that point the way toward complete independence of the "gray weather element"; yet at the present time fog still takes its heavy toll of life and property every year. As recently as last winter, there were days when, at New York, because of this nominally vanquished atmospheric enemy, not a vessel was able to move into or out of the harbor, and not a single airplane landed or took off at the airports fringing the city.

Using Radio Direction Finder to Navigate Ship in Fog, and "Pea Soup" Fog in London

Fog has not yet been conquered, and when its conquest is finally effected, the achievement will not be due entirely to the ingenuity of inventors.

Many things are known today about fog that were unknown a generation ago. Much light has lately been shed upon the ways by which the liquid or frozen fog

amazing. It is but a light fog that has only 1,000 droplets per cubic inch. A heavy fog has around 20,000. Indeed vastly greater numbers have been found, even up to nearly a million per cubic inch. But these droplets are, as stated, so excessively minute that the maximum density of a million per cubic inch would still leave the empty space 30,000 times greater than the volume actually occupied by all the liquid present."

When a small bright

Drawing of "Rain Tree" on Island of Ferro; an Example of Fog Drip and Fog Blanket Sliding over Table Mountain, South Africa

particles are formed from the invisible gaseous moisture of the atmosphere. These particles have been measured and counted, and the amounts of water they represent in various samples of fog have been determined. The depth of fog has been ascertained by the use of kites, balloons and other devices. The electrical, optical and acoustical properties of fog have been the subject of many investigations, with results that have more or less obvious bearings on the problem of making this weather factor less troublesome and dangerous to mankind. Some of the interesting facts about fog that have come to light within the past few years are set forth by Dr. W. J. Humphreys, of the weather bureau, in his recent book "Fogs and Clouds." He says:

"Everyone knows that a fog droplet is small, but not many, perhaps, realize that 2,500 of them, of the average size, placed side by side in a single row would extend only one inch. Nor is the number of fog particles in a definite volume any less light is viewed through a fog, it is seen to be surrounded by a series of colored rings, due to diffraction. The larger the droplets in the fog the smaller the rings, and vice versa. That the condensation of water vapor to form fogs and clouds is due to the cooling of the air is an old story, but until the latter part of the last century an important factor in this process was overlooked. The discovery was then made that condensation depends upon the presence in the air of minute

particles of some sort, mostly of ultra-microscopic size, which serve as nuclei around which the drops form.

What are these particles? They have usually been described under the indefinite name of "dust," and it was supposed until recently that all kinds of fine dust were equally effective in promoting condensation. It now appears, however, that condensation occurs mainly on particles consisting of substances that are highly hygroscopic, that have, in other words, a strong chemical affinity for water. One of these is common salt, immense quantities of which are supplied to the air by the evaporation of ocean spray and carried far inland by the winds. Others are compounds of sulphur, such as are constantly poured into the air by the combustion of fuels. Active volcanoes also supply hygroscopic particles. Recent discoveries concerning hygroscopic nuclei and their effects make it necessary to revise some of the statements and ideas hitherto accepted. They tell us, for example, that, in order to produce a fog, the air must be cooled below the temperature at which, with the amount of water vapor present, it is completely saturated, so that, in scientific language, its "relative humidity" is 100 per cent. Several cases, however, have lately been reported in which, owing to an abundance of salt in the atmosphere, haze and fog were formed with a humidity as low as seventy to seventy-five per cent. Such observations are of great importance. Thus, in predicting fog, the weather forecaster has heretofore considered only moisture and temperature conditions, but it would now seem that he should also take account of the prevalence or scarcity of hygroscopic nuclei in the region for which the forecast is made.

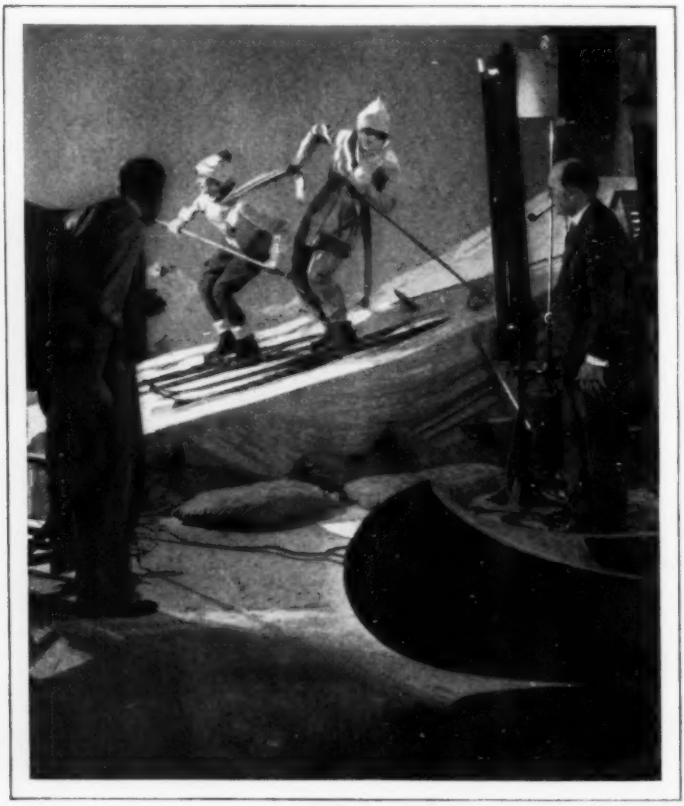
Archery Has Become a Water Sport; the Girl Diver Is Aiming at a Target as She Plunges from the Diving Board

ARCHERY AS A WATER SPORT MAKES FUN FOR DIVERS

Archery, always considered a sport for the open field, has been adopted by California bathers to add a thrill to diving. The diver, carrying bow and arrow, leaps from the diving board, aiming the arrow at a target as he falls, and attempting to execute both shot and dive perfectly.

AVERAGE AGE OF ARMY PILOTS

While flying is generally considered as a young man's game, the first provisional squadron of the first pursuit group, army air corps, is composed of aviators of exceptionally youthful appearance. This squadron, comprising some of the best flyers the army ever has trained, is made up of twenty-one pilots whose average age is only twenty-three years.



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Making a Photograph of a Skiing Scene for an Advertisement; the "Mountain" Slide Is a Man-Made Affair inside a New York Studio

HOW TRICK PHOTOS ARE MADE FOR ADVERTISEMENTS

Between five and fifty separate "shots" are taken in making a single trick photograph frequently seen in advertising various commodities. Most of these illustrations are made inside a studio. A recent scene depicts several women skiing down a mountainside. To take this picture, a mechanical mountain was made of wood scaffolding covered with canvas, cotton and mica, on which water and salt were poured. Accuracy in depicting history plays an important part in making some pictures. For a medical advertisement, it was desired to show a medieval doctor extracting an arrow from the body of a warrior. Various kinds of imitation clothes of the period were made in the studio workshop, but none photographed satisfactorily. Finally appeal was made to a New York museum, and an actual coat of chain mail was obtained with other genuine appurtenances of the time. On a large canvas a scene showing ancient castles was painted, and the actors posed before it. The result was a very unusual picture, complete in every detail.

RAIN MAKING FAILS BY PATENTED METHODS

Attempts to produce rain at will by artificial means thus far have met with failure. Army and navy planes have tried to precipitate moisture by condensing clouds and dispersing fog banks, more to get rid of the fog than to make it rain, but have been only partly successful. Army planes were equipped with a device ejecting electrically charged sand into the fog, but failed to achieve their objective, although in some cases the clouds dispersed. Rain resulted from somewhat similar tests by navy airplanes with artificial fog. A few instances were reported in which rain in varying amounts followed the electrical discharges from airplanes, the success of the test appearing to depend somewhat on weather conditions prevailing at the time the attempts were made. The severe drouth of the summer brought its usual crop of professional rain makers. Such an individual frequently enters into a contract to produce rain in ten days or two weeks, sets up a formidable-looking apparatus that discharges electric sparks or chemicals into the air, and awaits results. Since rain comes sooner or later, he gambles on the chance that it may come in the period involved, as he has nothing to lose but his time. If rain does fall, he credits the shower to his machine and collects. The government has issued several patents for rain-making machines and devices. One such pat-

ent proposes that balloons carrying high explosives be sent up and the discharge be set off electrically to produce a concussive force to condense moisture. Another has for its basic principle the spraying of liquid carbon-dioxide gas high in the air to cool the atmosphere and condense its moisture. Several patents also have been granted for balloons equipped with metal points to discharge electricity into the air.

LOUD SPEAKER AS SCARECROW

Radio is being employed by an English orchardist to keep birds from robbing his cherries. First, he tried a scarecrow of which the birds took little notice. Then revolving mirrors hung under the trees were used, also to no effect. Finally he connected a loud speaker back of the scarecrow to his radio set, and the birds deserted the orchard.

DOG CAGE FOR THE MOTOR CAR FITS ON TRUNK RACK

Hunters and families who carry their pets with them on automobile trips can now house them in a carrier that rides on the trunk rack. The carrier, about as large as an ordinary auto trunk, and with barred end for ventilation, is large enough to hold two dogs. It also may be attached to bumperettes on cars without a trunk rack.

Aaimal Carrier That Fits on the Trunk Rack for Transporting Pets on Motor Trips

The Big Bag Is a Tree Covered with Muslin, inside Which Butterflies and Moths Are Grown

BUTTERFLIES AND MOTHS BRED ON ENGLISH INSECT FARM

Butterflies and moths are grown for the market on an English insect farm where breeders of rare insects devote all their time to this odd task. Large sleeves of muslin are placed over trees and bushes and inside these the process from egg to caterpillar, from caterpillar to chrysalis, and finally to butterfly or moth is carefully supervised.

PLANES FIND COPPER ORE

Airplanes are being employed successfully in prospecting for copper in Africa. Copper ores in this region seem to prevent the growth of trees and vegetation above the veins. Airplanes, therefore, fly over the region, making maps and photographs wherever spots appear that are barren of trees. Expeditions are then sent to make mineralogical examinations. One of the richest copper veins in the world was found in this manner, the air picture showing a bare spot shaped like a horseshoe, about eight miles long and 100 feet wide. This was the exact length and width of the vein of ore.

THIS IS THE WORLD'S MOST ELABORATE RADIO SET

Artist's Drawings, Showing How Visitors to a New York Home Are Entertained by a Master Radio Set and Automatic Phonograph; It Extends to Every Room and to Gardens and Verandas as Well

Within the next few years, homes equipped with music in every room will be exceedingly popular with American music lovers. The first home of this kind already is in existence. "And why not?" asks its owner, F. Charles Schwedtman, retired vice president of the National City bank of New York, who not only has gone so far as to have music in every room of his house on the shores of the Hudson, but who has a loud speaker or two in his beautiful gardens. Mr. Schwedtman has probably the most elaborate residential radio hookup ever installed. His control is in a small room near the foyer of his house. In this room is located his panel

board, main switch, aerial control and power units. Ten individual speakers, built into the walls, somewhat similar to the old-fashioned hot-air register, except that they are constructed of wood to match the paneling, are placed in inconspicuous places in each room. In each of the bedrooms and guest rooms, the speakers are built into the clothes closets. Instead of having a speaker in the dining room, where music might interfere with dinner conversation, Mr. Schwedtman has an echo speaker located in the foyer just outside, which produces a soft flow of music throughout the entire front portion of the house. Speakers also are located in the servants' quarters, on the rear and front verandas and in a beautifully laid out garden. Here, Mr. Schwedtman also has made provisions for a screen for talking pictures, which will be installed in the near future. In a large tree in the center of the garden is a bird house with a false bottom. In this compartment is located the loud speaker. Mr. Schwedtman's music can be produced either from his radio or from an electric, automatic phonograph on the same hookup. He has an elaborate collection of unusual records, including many original bird, barking-dog and other animal records. Another record is one of street noises in London.

CHERRY SEEDER IS HANDY TOOL FOR CANNING TIME

Seeding cherries and other small fruit can be accomplished mechanically with the aid of a cherry pitter which resembles a nut-cracker in appearance. It is a pronged device, one prong containing a depression into which the cherries are slipped. The other prong holds a plunger placed at right angles to it. When the prongs are pressed together the plunger encounters the pit in the cherry.

DOCTOR'S OFFICE ON WHEELS AIDS RAILWAY MEN

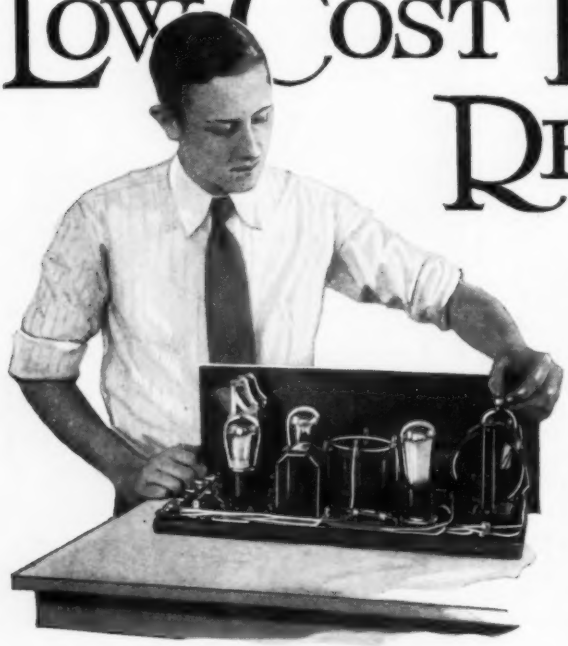
Inside the Traveling Office, Where Physicians Examine and Give First Aid to Employes

Physical examinations and first aid for employes of the Milwaukee road are given in a special car fitted as a doctor's office. It is equipped with X-ray and other apparatus necessary for the tests, and also has living quarters for the physician and his staff. Employes' records and the findings of the examining board are carried in the office section of the car, which is hauled into the railroad yards so that the men can visit it in less time than would be required to go to a distant office. The car, named "Metz" in honor of Dr. A. R. Metz, the road's chief surgeon, who conceived the idea, will be used over the entire system to supplement the work now being performed by the road's physicians and surgeons.

TWO MILES A MINUTE SPEED OF THE SWALLOW

Swallows fly as fast as an airplane, the speed of flight of one of them having been timed at more than two miles a minute. A Frenchman caught one that had flown into his room from a nest outside his window. A bit of red cloth was tied about the bird's leg for identification, and it was taken to a point twenty-eight miles distant and released. It arrived home in thirteen minutes and forty-five seconds.

Low Cost Feature Receiver

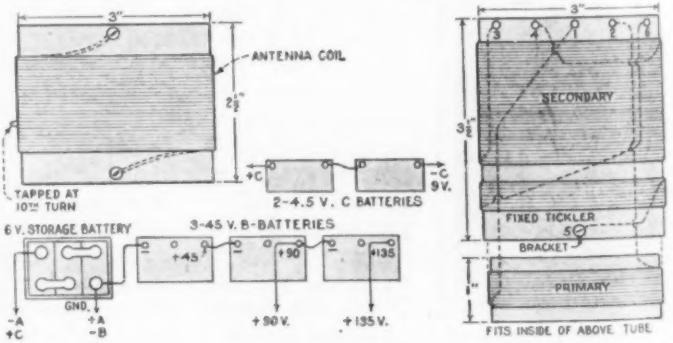


AFTER building many receivers and hearing numerous others, the writer has finally selected this simple circuit for several good reasons. It is simple enough for the beginner and its performance will satisfy the most critical set builder. Well within the range of limited pocketbooks and up to date in every way consistent with the low cost, this set is selective, sensitive and has fine tone with plenty of volume on loud speaker.

Battery operation makes the set suitable for those located in remote places or where no alternating current is available. The light construction makes portable application possible, and in this case dry-cell tubes of the 199-type may be used for the detector and first audio stages, and a type-120 dry-cell power tube in the last audio stage. To do this, the only changes necessary would be as follows: Use three No. 6 dry cells connected in series for the A-battery, shunt out amperite R_3 and connect suitable filament-control units directly in series with the negative legs of the two audio tubes; use an amperite No. 4V. 199 for the first audio tube and an amperite No. 120 for the power tube. The lead from F on the first a.f. transformer should be connected directly to the negative-A line; a C-bias of 22½ volts negative would then be necessary and should be connected to F-post on the second a.f. transformer.

In the near future, a new series of low-current-consumption tubes, specially designed for battery operation at 2 volts, will be placed on the market and may be used in this set with very few circuit changes. These tubes are superior to the present dry-cell tubes, and the necessary data for employing them in this set will appear in an early issue of this magazine, so that those who build this set may take advantage of the new method of low-cost operation at that time.

The parts for assembling the receiver can be picked up at any of the chain stores dealing in such merchandise at a very reasonable cost, a complete list of materials and enlarged layout and wiring diagrams being available for those who wish them. One of the features of this re-



Coil-Winding Details and Battery Connections for the Four-Tube DX Receiver

# of this FOUR-TUBE DX

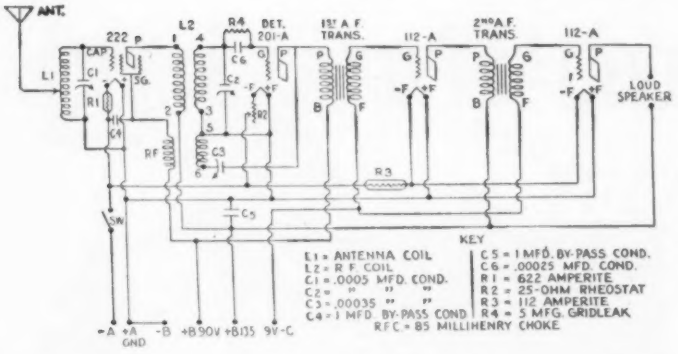
by F. E. Engle

ceiver is the hand-wound coils. Making these coils is the first step in starting construction, and the necessary material costs but a few cents.

In the original model shown in the photos, bakelite tubing, 3 in. in diameter, was used for these coils, but strong cardboard tubing will do as well if thoroughly dried in a slow oven, then coated with paraffin. The tube for the antenna coil is 2½ in. long and is wound with 47 turns of either No. 22 d.c.c. or enameled wire; a tap is taken at the tenth turn near the filament end. In some cases, it will be found that this tapped turn will vary more or less to suit the particular antenna used; if the builder wishes, he may do away with the tap and use a 10-turn primary winding spaced ¼ in. below the 47-turn coil on the same form. If he does, one end of the 10-turn coil should be connected to the antenna and the other end grounded. All coils are wound in the same direction.

The r.f. coil is wound on a tube of the same diameter and 3¼ in. long; 47 turns of No. 22 d.c.c wire are required for the secondary. The fixed tickler coil is wound directly below and is spaced ¼ in. from the secondary. It consists of 15 turns of No. 26 d.s.c. wire. The primary coil is wound in a ¼-in. groove cut in a tube that will just fit inside the secondary at the filament end. This piece of tubing is just 1 in. long, and the groove can be easily cut with a knife or hacksaw. If the builder finds it difficult to obtain a piece of tubing that will fit inside the 3-in. tube, it is a simple matter to cut a piece out of the 3-in. tubing and bring the ends together with gummed paper. This primary coil consists of 35 turns of No. 26 d.s.c wire. When winding all of these coils, bring the ends out through two small holes drilled in the tubing at the start and finish of each coil and anchor the wire by running it back and forth through the holes, the several inches of wire being retained at each end to reach the terminals at the ends of the tubes. The terminals are made with short brass machine screws and nuts, arranged as shown. All terminals on the r.f. coil L_2 are brought to the top except No. 5, which is connected to the machine screw that holds the small mounting bracket at the bottom. Another small angle bracket is used on the other side of the tube, and these brackets are screwed to the baseboard.

Mounting Antenna Coil on Bakelite Strip Supported above Baseboard by Means of Angle Bracket



The antenna coil is mounted horizontally by means of a strip of bakelite, ½ in. wide and 4½ in. long, held at the top and bottom with small brackets screwed to the tubing. The bakelite strip is held upright on the baseboard by means of a larger angle bracket, as shown in the photo at the lower left on page 825.

The wood baseboard is ¾ by 8 by 17 in., and the bakelite front panel is ⅛ by 7 by 18 in., a standard size that will fit the ordinary commercial cabinet. A binding-post strip is mounted on the left end of the baseboard, or a row of Fahnestock clips may be screwed directly to the baseboard as desired; note that the speaker-cord tips are to be connected to the lower clip and the upper clip, which also is the 135-volt B-battery terminal. Arrange the instruments on the baseboard with the terminals exactly as shown in the layout and simplified wiring diagram. The instrument arrangement on the front panel is very simple.

Locate the holes for the variable condenser shafts C_1 and C_2 exactly 3 in. from the bottom of the front panel and 6 in. from each end. The holes for the shafts of the variable condenser C_3 and the combination 25-ohm rheostat and filament switch are exactly 4¼ in. from the bottom of the panel and 2¼ in. from each end. These instruments are all held with a single mounting bushing and the rotor plates of C_3 face the end of the panel. The only additional holes will be along the bottom edge of the panel for wood screws which fasten it to the edge of the baseboard.

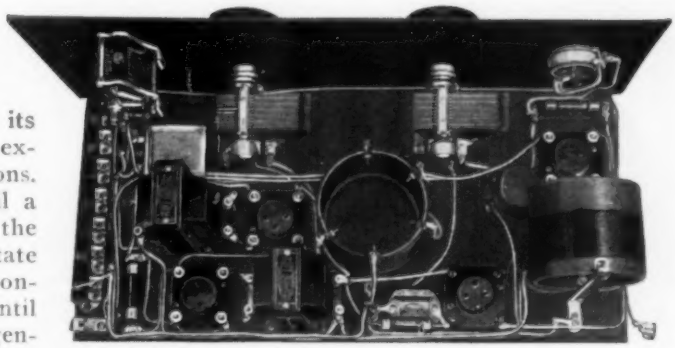
The socket for the screen-grid tube is indicated by the letters R.F. on the simplified wiring diagram on page 827, and the flexible lead terminating in the cap clip for this tube is connected to the grid end of the antenna coil L_1. The bypass condensers C_4 and C_5 are 1 mfd. each and should be of the 200-volt type. All wiring is done above the baseboard with flexible insulated wire, which may be ordinary hookup wire or No. 18 wire with push-back insulation. Solder each connection carefully and arrange the leads as neatly as possible, being careful not to parallel grid and plate leads.

The battery connections are shown in the sketch at the lower right on page 824. Three 45-volt B-batteries connected in series supply the necessary 90 volts for the detector plate and screen-grid of the r.f. tube, as well as 135 volts for the plates of the r.f. and audio amplifier tubes. Two 4½-volt C-batteries are connected in series for the 9-volt C-bias. The leads from these batteries should be cabled and the ends either stiffened with solder, or midget plugs may be used for insertion in the Fahnestock clips, as shown in the photo on this page.

A single-wire antenna, about 50 feet long, is all that is required with this receiver. Connect the ground lead to a water pipe, insert the tubes in their proper sockets, and the set is ready for operation. Make sure that the rotor plates of the variable condensers C_1 and C_2 are fully in when the dial reading is at 100, then tighten the small setscrews in each dial so that they will not slip on the shafts.

To operate the receiver, turn the knob of the rheostat from the off position,

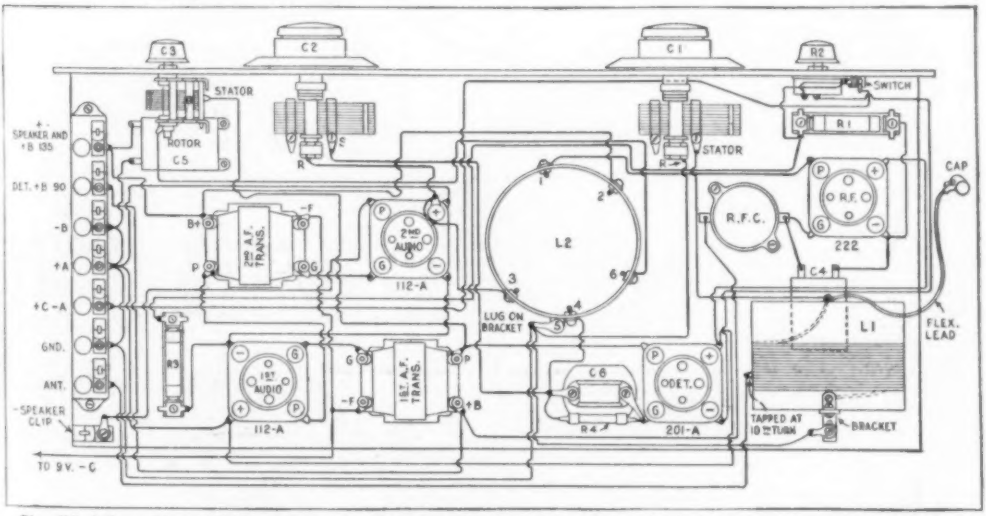
Midget Plugs Used for Connecting Battery Cable Leads to Terminal Strip



which closes the filament switch and lights the tubes. This rheostat controls the filament supply of the detector tube and its adjustment is not critical except on very distant stations. Turn up the rheostat until a hissing sound is heard in the phones or speaker and rotate the dials of the variable condensers C_1 and C_2 in step until a station is tuned in. Regeneration is controlled by the feedback condenser C_3; an ordinary rheostat knob is used on the shaft of this condenser as it takes up less space and no calibration is necessary.

When tuning for distant stations late at night, it is preferable to use a pair of headphones rather than try to reduce the loud-speaker volume to a point where it will not disturb those who have retired. There are additional reasons for the use of headphones when tuning for DX-stations, as many such stations are passed over in tuning when a loud speaker is used, and, with headphones clamped to the ears, the operator is not disturbed by others who may be in the room. As the DX-range of this receiver is rather unusual for a four-tube set, the builder will very likely wish to provide for the use of headphones. To do this in the simplest manner, remove the speaker terminals from the clips on the baseboard and connect a variable resistance in series with the phones. The variable resistor should have a range of from practically zero to 500,000 ohms, and such resistors are available in table-type mountings. A lead from one side of the variable resistor should be connected to the positive-B 135-volt clip, and the other side to one of the phone-cord tips; the other phone-tip cord goes to the speaker clip at the rear of the baseboard.

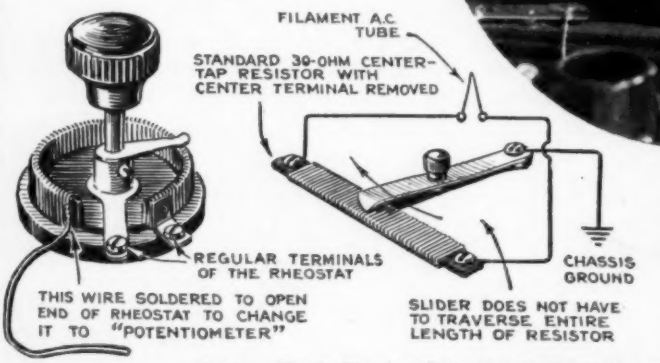
An open-circuit jack may be mounted on the front panel directly below the feedback condenser C_3 and connected across the primary of either the first or second audio transformer, if preferred. In this case, the variable-resistance unit is not required, but the speaker should be disconnected. Volume is controlled by detuning or adjusting the condenser C_3.



Simplified Layout and Wiring Diagram, Showing the Actual Location of Each Instrument and the Method of Wiring for Best Results

Helpful Hints

Above, Reducing High Line Voltage for Correct Operation of Power Units; Two Porcelain Sockets Are Connected in Parallel in One Side of the Line to the Plug Socket; Lamps of Various Sizes Are Used as Line Resistors; Right, Vaseline on Dial Gears for Easier Operation


FILAMENT A.C. TUBE
STANDARD 30-OHM CENTER-TAP RESISTOR WITH CENTER TERMINAL REMOVED
REGULAR TERMINALS OF THE RHEOSTAT
CHASSIS GROUND
THIS WIRE SOLDERED TO OPEN END OF RHEOSTAT TO CHANGE IT TO "POTENTIOMETER"
SLIDER DOES NOT HAVE TO TRAVERSE ENTIRE LENGTH OF RESISTOR

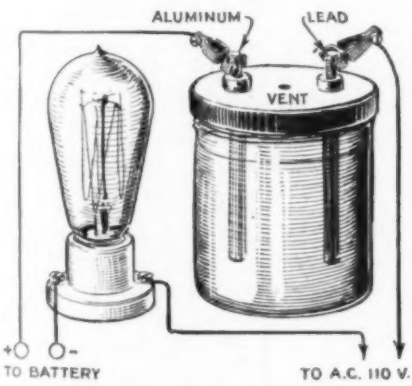
Left, Two Methods of Making Variable Center-Tap Resistors for Balancing Out Hum in A.C. Equipment; in Both Cases the Ends of the Resistance Wire Are Connected across the Tube Filament, and the Center or Sliding Contact Is Connected to Common Ground and Adjusted for Least Hum; Mount the Resistance near the Tube

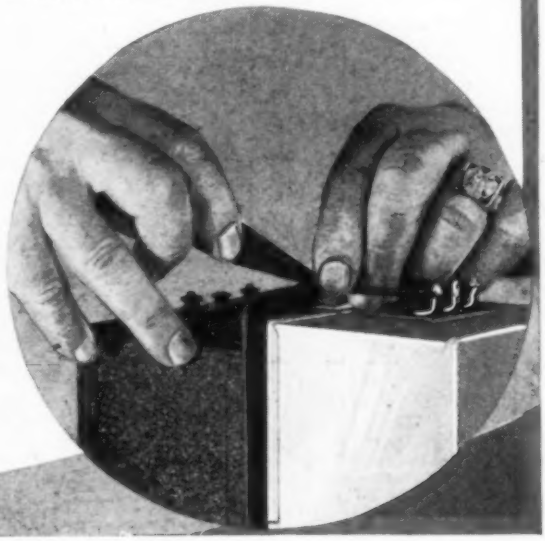
Below, a Handy Terminal Strip Made by Mounting Fahnestock Clips and Binding Posts on Bakelite; It May Be Fastened to the Baseboard, Chassis or Table by Means of Screws at Each End through Short Pieces of Brass or Fiber Tubing to Support It above the Baseboard; as No Soldered Connections Are Necessary, the Terminal Strip May Be Quickly Installed and Removed When Used with Experimental Apparatus

from the Radio Lab.

Left, Individual Shields for R.F. Coils Made from Large Aluminum Salt Shakers; the Handle Is Removed and the Screw Top Is Fastened to the Subpanel and Serves as the Bottom of the Shield through Which Holes Are Drilled for the Coil Leads

Below, Inexpensive Charger for Storage A-Batteries; Pint Fruit Jar Is Fitted with Wooden Cover in Which Holes Are Drilled 1 In. Apart for Electrodes; These Strips Are ¼ In. Thick, ⅝ In. Wide and 5 In. Long; Aluminum Must Be Free from Grease; Fasten Electrodes to Cover by Threading Ends for Nuts or Bend Ends Over and Drill for Binding Posts; Space Electrodes in Solution About ¼ In. Apart and Insert to Depth of 3 In. for ¼-Amp. Trickle-Charging Rate with a 60-Watt Lamp; to Increase Amperage Connect More Lamps in Series; Electrolyte Is Clear Saturated Solution of Common Borax; Heavy Oil on Top of Electrolyte Prevents Arcking

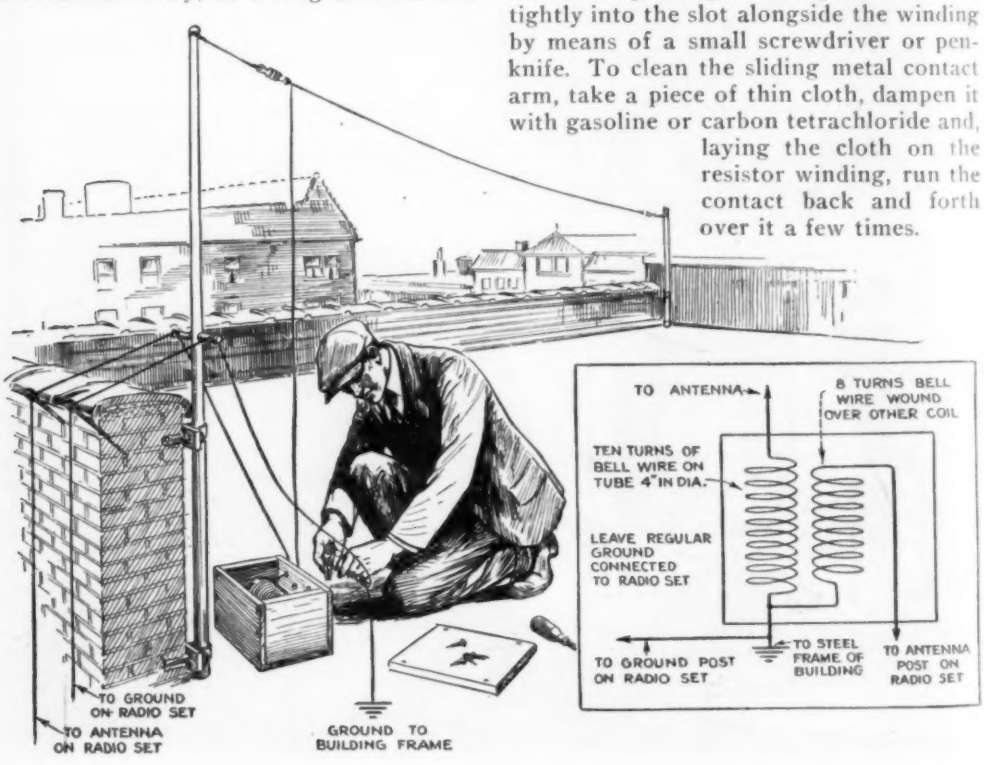




Right, Friction Tape for Added Insulation Where Wires Carrying High Voltage in Power Packs Run near Grounded Cases or Cross Another Wire of Low Potential

Antenna Kinks for DX-Fans

Many would-be DX-fans are troubled by an inefficient antenna. This condition is very common with apartment-house dwellers who must use a long lead-in to the set. An antenna with an excessively long lead-in is of but little more value than an antenna thrown on the floor of the apartment. For good reception in such a location, a feeder lead, as shown in the sketch, together with a coupling box placed on the roof will greatly extend the DX-possibilities. Keep the feeder wires about 1 ft. apart with suitable spreaders and about 1 ft. from the building. The spreaders may be glass rods or wood strips boiled in paraffin. The coupling box is very simple, the first coil being covered with tape and the second coil wound over it as outlined. If the set owner is located in a part of the country where there are few high-powered stations, it is usually a good idea to increase the length of the antenna for DX-reception. This is especially advised if there is local interference from electrically operated machinery, as a long antenna will generally increase the signal strength more than the noise. Where man-made static is very bad and filters are not practical, a shielded wire lead-in will often help. Do not ground the shield, but insulate it and treat it as if it were the lead-in itself.—Vern Peters, Havre, Mont.


TO ANTENNA
8 TURNS BELL WIRE WOUND OVER OTHER COIL
TEN TURNS OF BELL WIRE ON TUBE 4" IN DIA.
LEAVE REGULAR GROUND CONNECTED TO RADIO SET
TO GROUND POST ON RADIO SET
TO STEEL FRAME OF BUILDING
TO ANTENNA POST ON RADIO SET
TO GROUND ON RADIO SET
TO ANTENNA ON RADIO SET
GROUND TO BUILDING FRAME

Hints for the Radio Service Man

One of the small mirrors fitted with a long handle, such as used by dentists and physicians, comes in handy for exploring inaccessible places in sets, power packs, and the like. This instrument and a small flashlight have proved invaluable many times. The volume-control resistor is a frequent cause of trouble in modern radio sets. It becomes noisy, which is usually caused by grease and dirt accumulating on the wire surface, if the resistor is of the wire-wound type. The dirt may be removed by means of a clean rag soaked in gasoline or carbon tetrachloride. If the resistor is burned "open" at some point, and no new resistor is available, an emergency repair may be made by locating the break and packing a small piece of tinfoil tightly into the slot alongside the winding by means of a small screwdriver or penknife. To clean the sliding metal contact arm, take a piece of thin cloth, dampen it with gasoline or carbon tetrachloride and, laying the cloth on the resistor winding, run the contact back and forth over it a few times.

A Switchless Test Panel

by C. I. Schmidt

THIS simple testing panel was designed with the idea not only of doing away with switches, but of making the meters serve for other purposes as well.

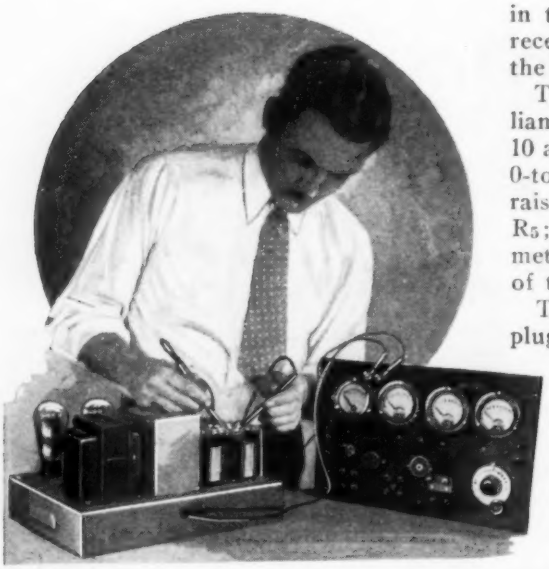
The panel contains a self-modulated oscillator, operated from the ordinary 110-volt a.c. supply line. The range of this oscillator is from 200 to 600 meters, covering the whole of the present broadcast band. The output is constant enough to be used for balancing the r.f. stages of a broadcast receiver. An a.c. and a d.c. cable with suitable adapter plugs, which may be purchased or made from discarded tube bases, are employed to plug into the tube sockets of the radio set. The 0-to-1 milliammeter is used as a continuity meter for testing and tracing the various parts of the receiver and power pack. It is connected into the panel permanently, with all the necessary batteries and resistors.

The 0-to-10 milliammeter, 0-to-10 a.c. voltmeter and the high-resistance d.c. voltmeter may all be used independently of the panel itself. The instruments are mounted on a bakelite panel as in the layout diagram on page 832; the arrangement of the instruments is clearly shown both front and rear in the various photos. Along the lower edge of the panel small tip jacks, indicated by numbers from 1 to 13, are arranged exactly as shown in the diagram given on page 833. These tip jacks provide the necessary connections for using the meters for other purposes, and, in some of the tests, they are bridged with jumpers for the necessary connections, the jumpers being of flexible insulated wire with a small plug at each end. Tip jacks 1 and 2 are the terminals for the a.c. voltmeter, 5 and 6 for the high-resistance d.c. voltmeter and 10 and 11 for the d.c. milliammeter. The mounting base for the 40-watt lamp and 1½-volt battery is a strip of bakelite, supported on four machine screws to clear the back of the meters. The 40-watt lamp acts as a resistance, reducing the filament voltage to 5 volts for the oscillator tube. The vernier dial on the right side of the front panel is the only control for the oscillator. Enlarged layouts and wiring diagrams are available for those who wish them.

To measure plate and filament voltages of a battery-operated set in operation, remove the tube from the set and insert the d.c. adapter which carries leads from A-negative, A-positive and plate prongs to binding posts H, I and J on the panel. To read the plate voltage, plug in wire jumpers between jacks 5 and 8, and 6 and 9. Keep the multiplier resistor, supplied by the manufacturer of the meter to raise the range of the meter from 50 to 250 volts, shunted out if the voltage is under 50. If the voltage to be measured exceeds 50, open the shunt to place the resistance in series with the meter as shown. This shunt may be a piece of busbar wire or a switch connected across the resistance.

To read filament voltage, place wire jumpers across jacks 5 and 8, and 6 and 7. When reading filament voltage, always shunt out the multiplier resistor. To read plate current, place the tube in the d.c. four-prong tube socket on the test panel, plug the d.c. adapter in the tube socket as before, and plug in wire jumpers between jacks 10 and 13, and 11 and 12.

Where the current drain exceeds 10

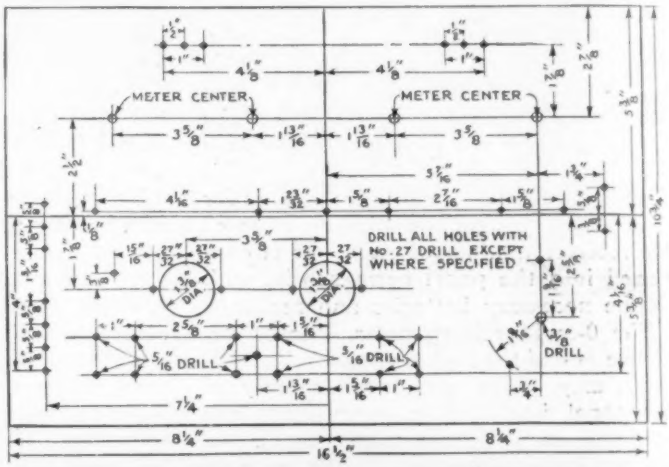


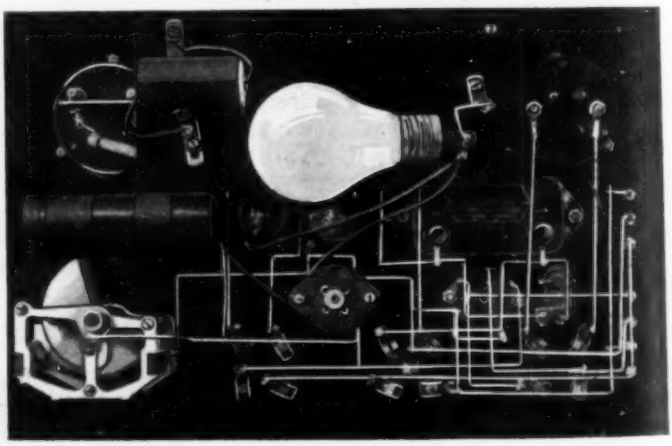
milliamp., as is the case in most power tubes, it is necessary to use an external shunt to extend the range from 10 to 100 milliamp. This shunt, R_5, consists of a wire-wound strip resistor mounted on a small piece of bakelite and provided with plugs and binding posts; it is plugged in at jacks 10 and 11 when required.

To measure the plate and filament voltages of an a.c. receiver, use the a.c. plug adapter with the four-wire cable connected to binding posts K, L, M and N; these posts are for the two heater connections, cathode and plate of the a.c. tube. Insert the adapter in the tube socket and proceed as when using the d.c. set-up. To measure the filament or heater voltages, use jumpers across jacks 1 and 3, and 2 and 4. To measure plate-current drain, insert the tube in the five-prong socket in the test panel, and the plug into the receiver tube socket; then proceed as in the d.c. set-up.

To measure the current drain in milliamp. of the entire receiver, use jacks 10 and 11; these are the terminals of the 0-to-10 d.c. milliammeter with the range raised to 100 mills by the shunt resistor R_5; to obtain the reading, connect this meter in series with the B-negative lead of the set.

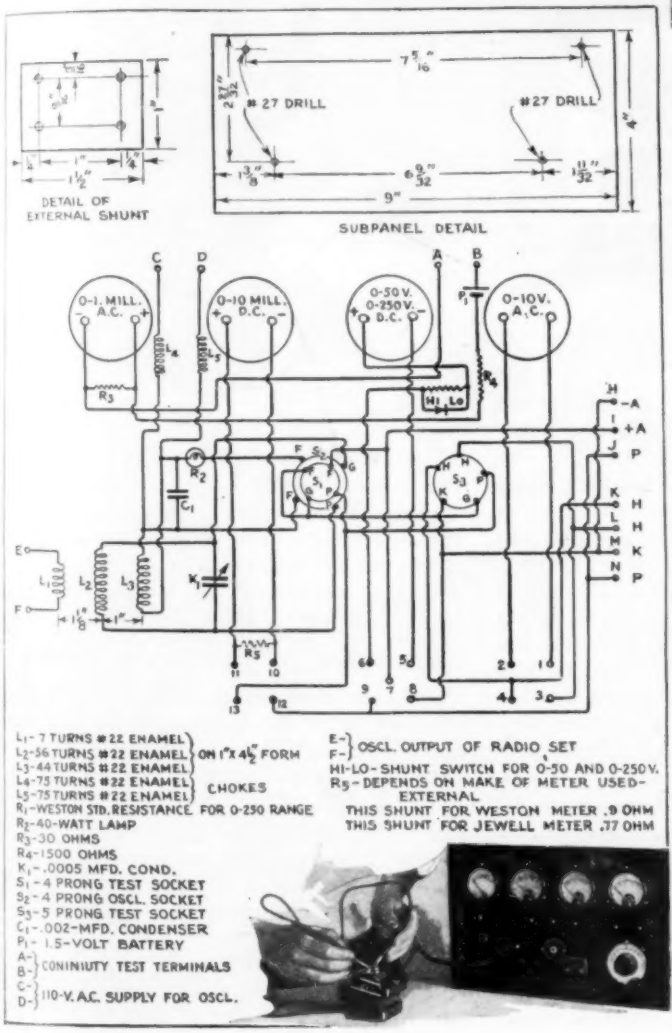
To use the self-modulated oscillator, plug an ordinary 201-A tube into the socket shown in the rear view of the panel, just below the 40-watt lamp. This socket is supported above the panel by means of machine screws through short pieces of fiber tubing. Binding posts C and D are for the 110-volt a.c. supply leads. In cases where the inductive pick-up of the



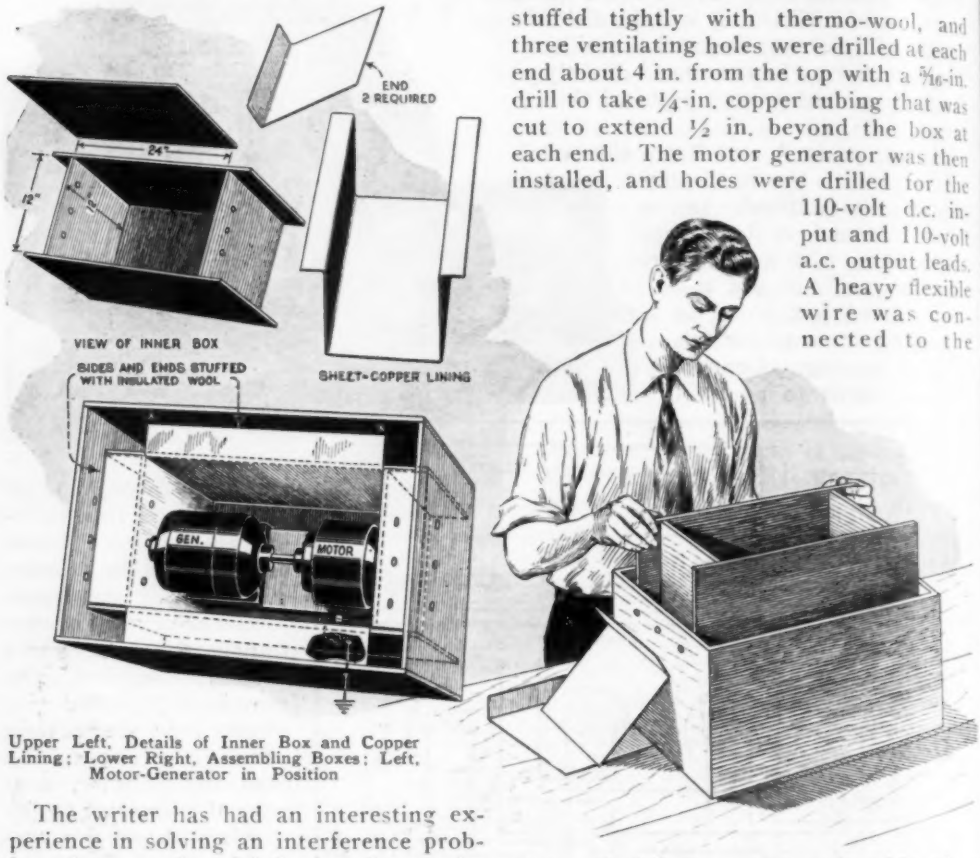


oscillator is not sufficient for the necessary tests on the receiver, the two binding posts marked E and F will furnish the direct r.f. pick-up from the oscillator. These posts may be connected directly to the antenna and ground posts of the receiver.

Binding posts A and B are the terminals used with the meter employed as a continuity tester. Test cords made of flexible insulated wire, with a spade terminal lug at one end and an insulated test point on the other, are used for this type of testing. Connect the test cords to posts A and B, for example, when testing audio transformers, then place the test points across the primary winding. If the transformer windings are continuous, the meter needle should be deflected. The continuity meter will show less deflection across the secondary than the primary, enabling the operator to determine primary and secondary terminals on an unmarked transformer. Continuity tests are also applied to resistors, voltage dividers, by-pass and filter condensers, wires in cables, r.f. coils, choke coils, shorted tuning condensers and grounded parts, which have broken down owing to some electrical or mechanical stress. This compact test panel may be permanently mounted on the workbench by means of shelf brackets; the writer, however, found it more convenient for portable use when installed in a small suitcase.



REDUCING INTERFERENCE BY ROTARY CONVERTER



Upper Left, Details of Inner Box and Copper Lining; Lower Right, Assembling Boxes; Left, Motor-Generator in Position

The writer has had an interesting experience in solving an interference problem that may be of help to others. An a.c. receiver, installed in a modern steel-frame apartment building located in a district supplied with d.c. current, was operated by means of a rotary converter. This converter caused so much interference that only local stations could be received with fair results. Professional trouble shooters failed to remedy the trouble, and as a final resort, the double box shown in the sketch was built and tried out with good effect. The boxes were built of 1-in. lumber, and the inside measurements of the inner box were 12 by 12 by 24 in. These dimensions will, of course, vary with the type of converter used. The sides of the inner box extend 2 in. beyond at each end, as shown, and the outer box is built to provide this 2-in. space all around. The inner box was lined with asbestos paper and sheet copper, cut as shown. The cavities were stuffed tightly with thermo-wool, and three ventilating holes were drilled at each end about 4 in. from the top with a 5/16-in. drill to take ¼-in. copper tubing that was cut to extend ½ in. beyond the box at each end. The motor generator was then installed, and holes were drilled for the 110-volt d.c. input and 110-volt a.c. output leads. A heavy flexible wire was connected to the base of the generator and soldered to the copper lining. Another lead, soldered to this copper lining, was taken through the outer box to a water-pipe ground. The result was quiet operation on both local and DX-reception.—G. Young, Chicago.

Connecting Power Supply to Receiver

When connecting the power supply to a receiver it is advisable to connect the filament circuit first. Then test to make sure that this is correct, each tube lighting as it should. The remaining leads for the plate supply may then be connected in the usual manner with no danger of high voltage on the filament circuit caused by improper connections.

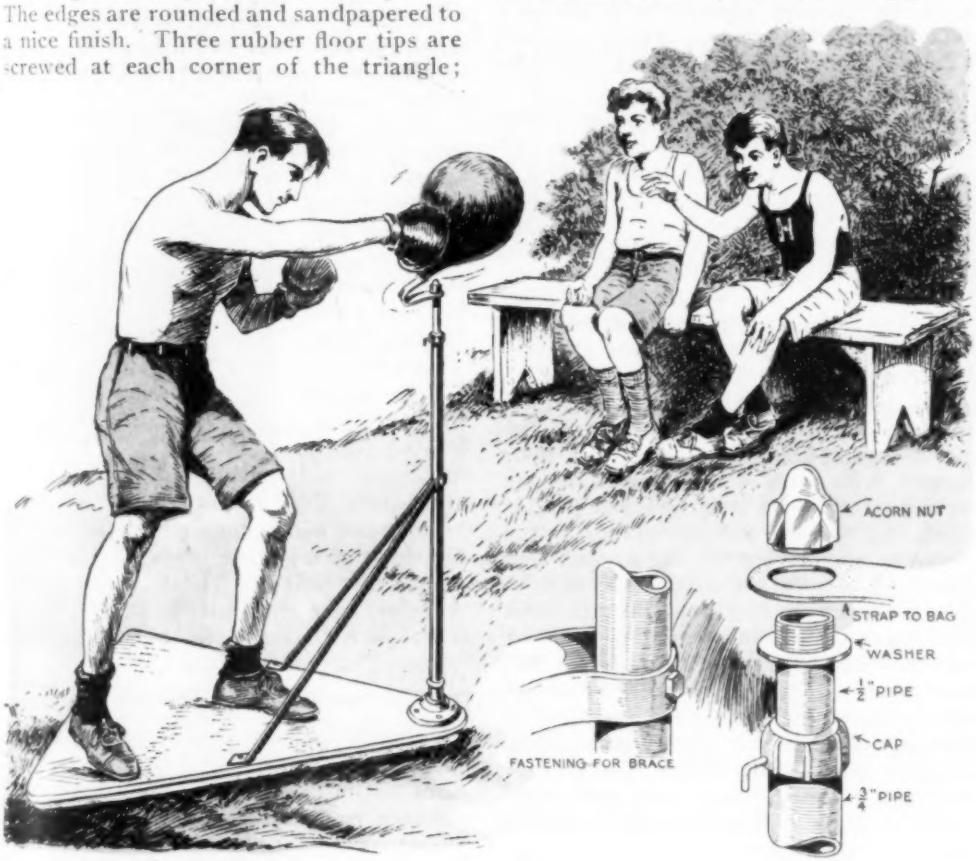
¶For further information on any radio construction article write to the radio department; this service is free.

How to Make a "Whirlo" Punch Bag

By E. J. VERONDA

THIS exercising device is decidedly different in construction, and even more so in operation, from the usual punching bag. The base is made of hardware, 1 in. thick, the boards being edge-glued and held firmly together by two crosspieces screwed on the underside. This platform, a triangle in shape, measures 2 by 3 ft. The edges are rounded and sandpapered to a nice finish. Three rubber floor tips are screwed at each corner of the triangle; these cushion the operator's weight and prevent slipping.

The metal standard consists of a piece of ¾-in. pipe, 30 in. long and threaded on both ends. On one end a floor flange is screwed, and on the other a cap in which has been drilled a ¾-in. hole. This is done to allow a piece of ½-in. pipe to



telescope into the larger one. The cap is drilled on its side and tapped for a ⅜-in. thread, and is fitted with a short bolt that has been bent at right angles, leaving about 1 in. of thread on one end. This setscrew is needed to adjust the height of the standard. The telescoping pipe should be cut to 17 in., its end threaded to carry an acorn nut, and a washer brazed on ½ in. below this thread.

The brace extending from the platform to the upright standard is made in one piece of ¼ by ½-in. strap iron, bent as illustrated; it is fastened at a height of 15 in. on the pipe support by means of a bolt through both pieces. The lower ends of this brace are screwed to the base about 18 in. from the flange.

The punching unit is now prepared, and consists of a regulation bag to which is riveted a 4-in. leather strap having a ¾-in. hole in its end to allow its being slipped over the pipe and under the acorn nut. This strap is fixed to the punching bag by merely cutting the fastening loop with which the bag is provided, placing the strap between the two pieces thus formed and fastening the three together by a copper rivet.

The punching bag is now completed, and can be finished as desired. If the platform is of oak, two coats of floor varnish will, with black enamel on the metal parts, give an attractive and durable finish. In use, the operator stands on the platform, and, giving the bag a whirl with one hand, punches it with the other fist after it has completed a revolution. This blow causes the motion to be reversed.

With crossed fists, the lightninglike skill that comes with practice is truly amazing; using either hand singly, or together in rapid alternation, with, at times, the bag whirling several times under its own momentum, makes in all a sport that gives healthful fun, and calls forth the invention of many combination punches.

Making a Rubber-Stamp Impression Appear Like Embossing

Imitation embossed stationery may be made with a rubber stamp in the following manner: Procure some fine printing ink and spread it evenly on a piece of cardboard; then press the rubber stamp on this as on a stamp pad. Stamp on the stationery, so as to make an even imprint; then cover the impression with finely powdered rosin and shake off the excess rosin. Pass the printed side of the stationery over a gas light, lamp, or stove, until it fuses the ink and rosin; then lay it to dry in a cool place. Best results can be had by using a light-colored rosin. New or clean rubber stamps make the letters sharp and clean. For bright colors, use a very light-colored rosin and light shades of printing ink.

Old Stovepipe Protects Young Trees

Sections of discarded stovepipe, placed about young trees as shown, will protect the trunks against injury by rabbits and other small animals. Either a whole joint may be used for each tree or the joints may be cut in half to serve two. The stovepipe should fit loosely about the trunk, leaving plenty of room for growth. Besides being stuck into the ground, the pipe should be wrapped with a couple of turns of wire. Newly set trees bordering a state highway across the Antelope valley, north of Los Angeles, were effectively protected in this way.—C. A. Byers, Los Angeles, Calif.

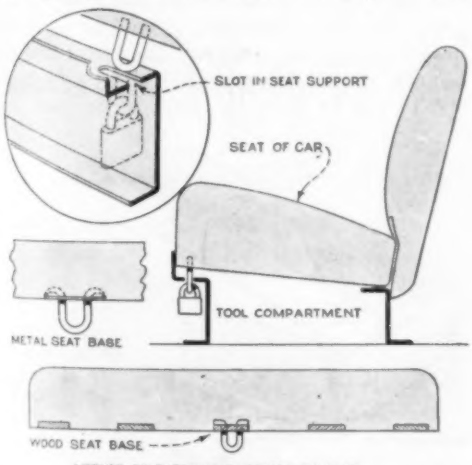
Waterproofing Canvas with Paraffin

A handy method of waterproofing canvas is as follows: Melt 1 lb. paraffin in a dish. Remove the melted paraffin a safe distance from the fire, and pour it into a gallon of gasoline. Stir the gasoline as

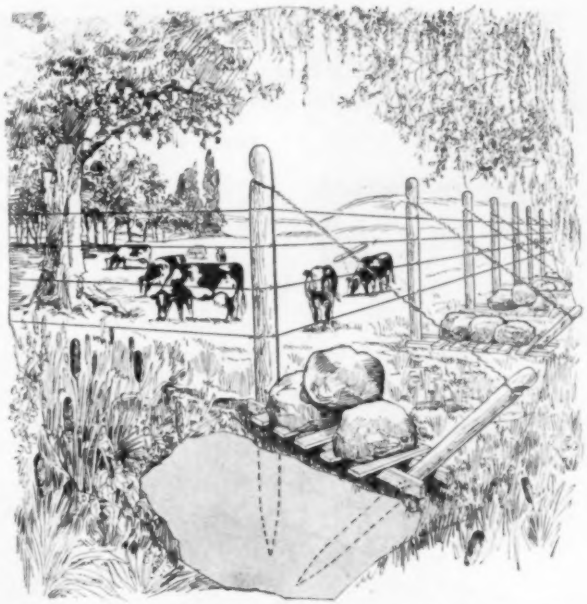
the paraffin is put in so that it will mix well, and keep the gasoline as well as the mixture away from the fire. The heating should be done out of doors. Hang the material to be waterproofed over a line. With a clean paintbrush, apply the liquid like paint. The gasoline carries the paraffin into the fabric. In a few hours the gasoline will have evaporated, leaving the canvas smooth, clean, flexible and waterproof.

Lock for Auto Seat Protects Your Tools

Tools, which lie in the compartment usually provided under an auto seat, can readily be removed without the owner's knowledge, unless some method of locking the seat is provided. An easy method of doing this is shown in the drawing, the idea being equally applicable to either metal or wooden seat supports. A heavy staple is driven into the underside of the seat and the ends spread apart to clinch it. The staple should project far enough from the underside of the seat to pass through the seat support, a slot being cut through the latter for this purpose. A strong padlock is then slipped through the staple which makes it practically impossible to remove the seat except by force to which the petty thief does not usually resort.



Staple and Padlock Keep Petty Thief from Auto Tool Compartment



Effective Method of Bracing Fenceposts in Marshy Ground to Prevent Them from Sagging

Holding a Fence Rigid in the Marsh

In order to prevent the fenceposts in a marsh from being pulled over by the strain on the wire, the bracing of each post has been found effective. A heavy stake is driven into the ground at an angle to the fencepost, and two lengths of 2 by 4-in. stock are nailed to both stake and post. Short pieces of 1-in. stock are nailed on top to form a platform. A guy wire is run from the top of the post to the top of the stake, and then some heavy rocks are piled on the platform.

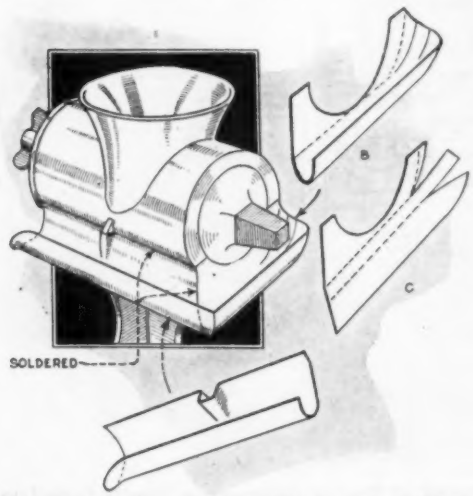
Ridding Camp of Flies

Permanganate of potassium will quickly and effectively solve the fly problem of the camper. Keep the chemical in a spice can, being careful to label the container. Just before throwing out the dish water shake a little of the chemical into it. You will find that flies will give the dishwater a wide berth.

¶When the baby's new shoes are still slick on the soles, or trouble is experienced on waxed floors, apply a strip of adhesive tape to the soles; this will prevent many a hard fall.

Juice Tray Attached to Food Grinder

When grinding food that is rich in juice, much of it runs out and gets on the floor.



Sheet-Metal Tray or Gutter Soldered to Food Grinder Catches the Juice

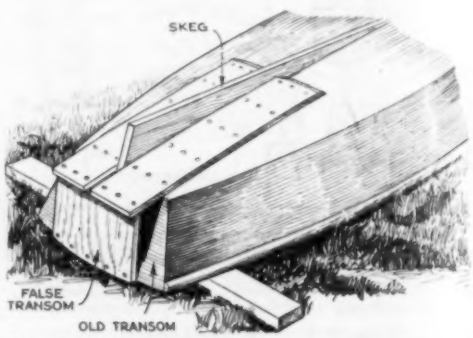
Although the method of preventing this by using a dish is effective, it is rather unhandy. A much better method is to provide a sheet-metal tray or gutter, as shown in the drawing, which is permanently soldered to the grinder.—Geo. H. Cappel, Wilmer, Ala.

Eliminating Squeaks from Model-A Fords

Among the points where squeaks are likely to occur on the model-A Ford, is the front motor support. This is fitted with a stud which passes down through a hole in the front crossmember of the frame and retains a coil spring and nut. The stud sometimes rubs on the side of the opening, which causes a squeak. To stop this, bend the stud over toward the center of the opening by tapping it with a hammer. The rod below the starter button will often rub against the metal of the body, through which it passes just ahead of the floorboards. Shifting the rubber guide after loosening the two screws will permit the rod to stand in the center of the opening and prevent rubbing. A little hard grease on the rod is also a good method of overcoming the trouble. The fabric strips on the dash and radiator shell will become hard and rub against the inside of the hood, which can also be prevented by applying a light coat of hard grease. The front floorboard will squeak against the metal along its front edge, if the screws holding it down are not fastened tight. Greasing the fabric covering along the edge of this board will help to keep it silent. Another point where a squeak may occur is between the rubber buttons, which are riveted to the hood, and the hood fasteners. Usually this happens while driving on uneven roads which cause the frame to become slightly distorted. The springs often squeak near the center where they are covered by the frame. To reach this point, use an oil or spray gun.

Adapting an Outboard Motor to a Dory

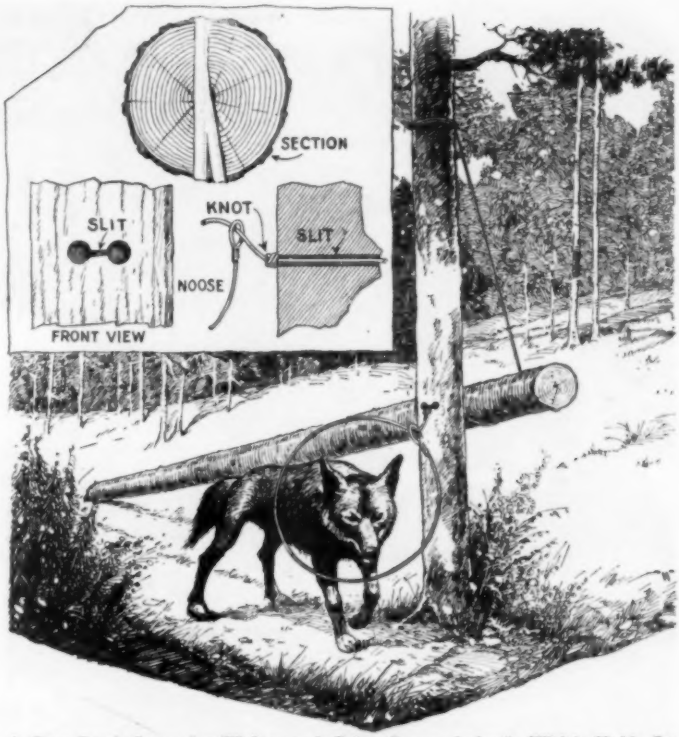
Many dory owners find trouble in attaching an outboard motor, owing to the sharp angle at which the stern transom slants back. To overcome this trouble, a false transom, as shown in the illustration, has been used with success. The dory was turned over and two boards, each 1 ft. wide, were screwed to the bottom, close against the skeg, and were allowed to project about 4 or 5 in. beyond the transom. A second piece was then screwed to the top edge of the transom and the bottom end was beveled to fit down on the two bottom boards, the latter being then screwed to the vertical piece or false transom from underneath. The motor is clamped to the transom in the usual way but with the described attachment it is held at a suitable angle. The two bottom boards should be tapered off at the forward ends in order to reduce friction.



False Transom on Dory Makes It Suitable for Using Outboard Motor

Sure-Catch Snare for Wolves and Coyotes

Snaring coyote, wolf and lynx with a spring pole is not always dependable or humane, as the spring gradually leaves the pole and it takes a long time to strangle the animal if it does not get away by kinking and twisting the wire. I devised an effective snare which eliminates these troubles. Through a small tree, about 4 or 5 in. in diameter, along the trail where the catch is probable, a 1-in. hole is bored, slanting downward on the side away from the trail and a little toward one side. Bore another hole of the same size about ⅜ in. from the first, joining it about halfway through the tree. Cut a horizontal slit through the partition separating the two holes, as shown in the front view. The slit should be large enough for the wire to work through freely. Make a suitable noose and tie a knot in the wire about 4 in. from the noose, the size of the knot being such that it will slip through the holes but not through the slit. Pass the other end of the wire through the tree and fasten it about 6 ft. above the hole. The knot is adjusted so that it comes against the slit.



A Sure-Catch Snare for Wolves and Other Large Animals Which Holds Its Victim and Strangles It Quickly

Then put one end of a log, about 12 ft. long and 6 in. in diameter, between the wire and the tree, resting it on the wire as indicated. Adjust the noose, and the snare is ready for action. When the animal gets into the snare and pulls toward one side or the other the knot slips through one of the holes and the weight of the log then quickly takes up the slack in the noose and strangles the animal.—J. J. Brindos, Big Falls, Minn.

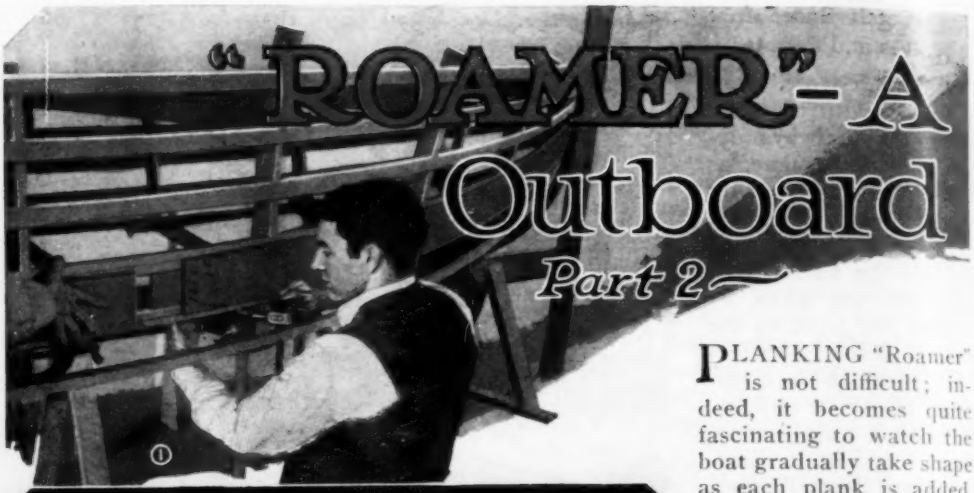
Electric Convenience Outlet on the Porch

Outside electric decoration at Christmas time, or on other occasions, is becoming popular in many sections of the country. When electric light is needed on the lawn, an extension line is run either from the porch, but this has the disadvantage of leaving the front door in darkness, or through a window, which is equally unsatisfactory in most cases. A builder in a mid-western city solved the problem by providing an electric convenience outlet on the outside of the house, about a foot above the floor of the porch. This outlet is installed flush with the wall and is of the weatherproof type. It can also be used during the summer time for a variety of purposes, such as for the electric fan, children's electric toys, or for a percolator and toaster.

¶When starting your auto in cold weather, soak a rag in hot water and wrap it around the carburetor and intake manifold.

"ROAMER"—A Outboard

Part 2



PLANKING "Roamer" is not difficult; indeed, it becomes quite fascinating to watch the boat gradually take shape as each plank is added. Planking for each side consists of six ⅜-in. planks. The bottom is double-planked, with a first layer of ¼-in. red-

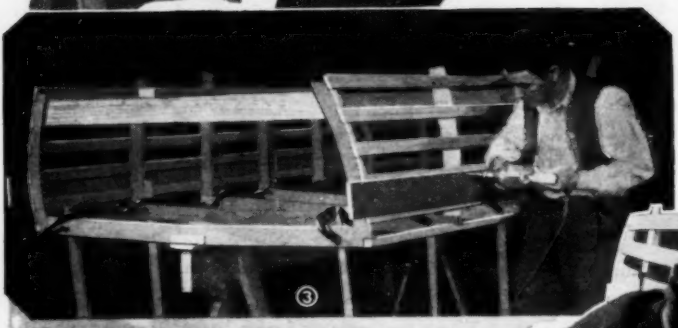


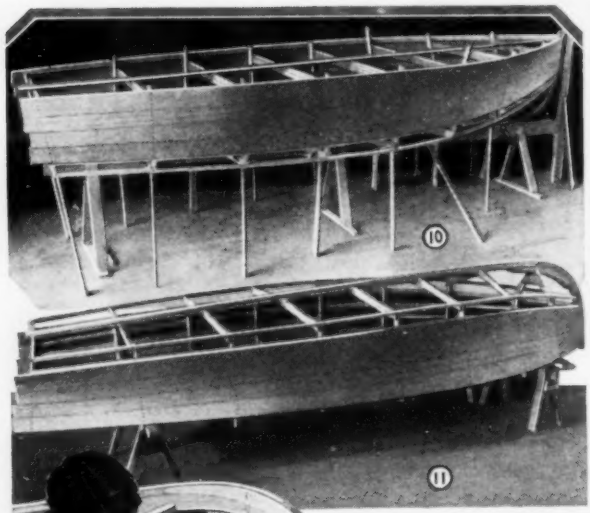
FIG. 5

Speedy Cruiser

by Sam Brown

wood, then a layer of canvas set in paint, and finally ten ⅜-in. planks, five on each side of the keel. It is usually possible to secure the planking in single lengths, but one or two planks on each side and on the bottom can be made up of two shorter pieces, neatly butted, without impairing the strength or seaworthiness of the boat. All butted planks should be backed with a wooden block, as thick as the battens and about 6 in. long, as in Fig. 1.

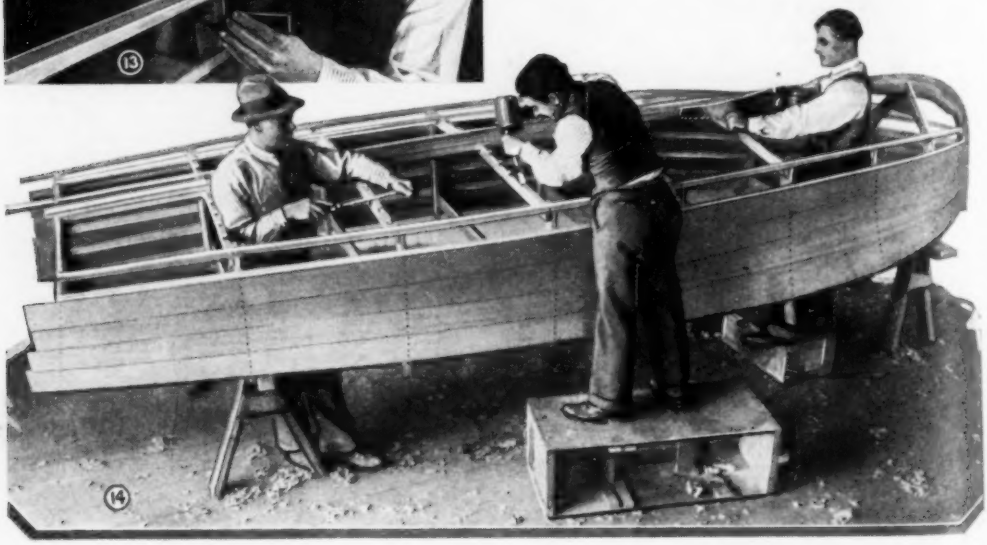
As can be gathered from Fig. 1, the first plank to be applied fits from the centerline of the lowest side batten to the



centerline of the batten immediately above it. In putting on this or any other plank, the first fastenings consist of four 1¼-in. No. 6 brass screws, driven through the plank and into the stem, as in Fig. 2. Four similar screws are used in fastening the plank to each frame, working back to the rear of the boat. If the plank is butted, each end of the joining timbers is fastened with several 1-in. No. 15 copper wire nails, spaced as shown in Fig. 1.

After inserting the screws holding the plank to the frames, you are ready for the second course of fastenings, which consist of 1-in. copper wire nails, driven through the edge of the plank, through the batten behind, and then clinched. These nails are spaced about 1½ in. apart, and slightly staggered to lessen the danger of splitting. Even then it is advisable to drill holes first, as in Fig. 3, and then drive the nails. An electric drill and a fast ratchet screwdriver will be found quite handy boatbuilding tools.

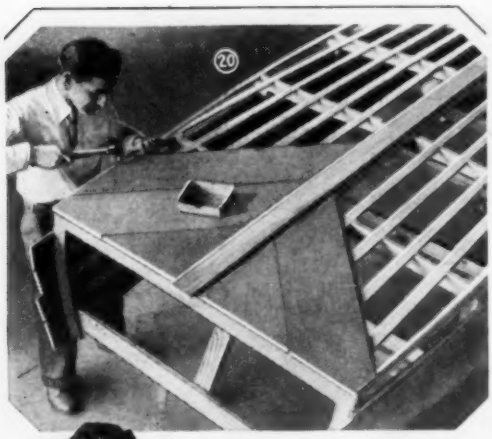
Of course, before the plank is fastened into position, you must cut it to the proper shape so that it will fit neatly from batten centerline to batten centerline, and lie close up against the rabbet in the stem. Numerous methods are used in determining the proper shape of each plank, rang-

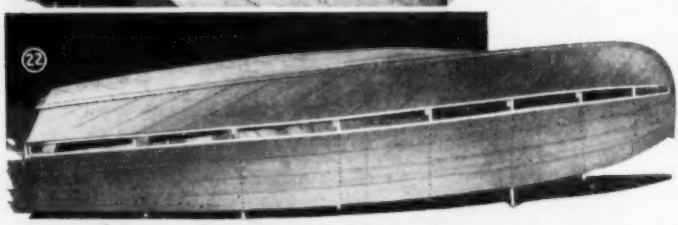


ing all the way from fitting a straight plank and then penciling around it, to making a separate paper pattern for each streak. One of the most satisfactory methods consists in taking a "spiling" of each plank. This way calls for a thin piece of wood, 2 or 3 in. wide and about 17 ft. long, known as a "spiling board."

You nail the spiling board into position between the two battens which the plank must cover, as shown in Fig. 4. Then, using a thin bit of wood shaped like Fig. 5, you mark the spiling board, keeping one edge or end of the bit of wood snug against the mark to which the plank must fit; in this case the upper edge of the plank below, as in Fig. 6. Mark the spiling board in this fashion about every 8 in., continuing along each side and including the markings for the rabbet in the stem. Then remove the spiling board and nail it lightly to the piece of timber which is to be the plank. You can readily see that, if the bit of wood is placed on the original markings on the spiling board, as in Figs. 7 and 8, and the end or side marking taken off on the plank, you will get a series of guide marks which will coincide exactly with the lines which the plank must meet. Joining these marks in a continuous sweep, you get the true shape of the plank, which, when cut, usually needs but little more than a few strokes with a smoothing plane to make a perfect fit.

Theoretically, both sides of your boat should be exactly alike, so that a plank cut for one side should come close to fitting the corresponding space on the other side. Knowing this, you





can cut one plank from a heavy piece of timber, and then have this plank ripped into two thinner planks to furnish one for each side of the boat. If your lumber is already ⅜ in. thick, two pieces can be lightly nailed together and sawed out at the same time. Again, as the lower edge of any plank is exactly the same as the top edge of the plank under it, the lower edge of the second plank can be marked and cut before the first plank is permanently fastened into place. With one edge shaped on the second plank, the other (top) edge can be obtained by fitting the plank into place, then drawing a pencil along the under edge of the batten to which the top edge must be fitted. Removing the plank, you would add ¾ in. to the pencil marking so that the plank will fit to the center of the batten.

All in all, the spiling board is the most practical. Knowing how to shape the planks and how to fasten them into place, the only thing which need be added to your planking knowledge is the order in which the planks are applied. Start with the plank shown in Fig. 1, and apply this on either side; then work upward, fastening a plank on one side and then the other, in order to equalize any strain on the frame structure. The top, or sheer, plank is brought flush to the top of the batten instead of to the centerline. No calking of any kind is used on these side planks, and for that reason it is essential that each plank be a tight fit against its neighbor. To assist in obtaining this close fit, it is wise to pull each plank down on top of the one below it with clamps, as in Fig. 9, before putting in any fastenings. Fig. 9 also pictures how three men can work to best advantage on this job of planking, one man drilling the holes, a second driving the nails, and the third turning in the screws. Fig. 10 shows the side planking on with the exception of the lowermost, or "shutter," plank, which is not put on until the bottom planking is fastened. With the side planking on, the boat is rigidly tied to shape, and all clamps and braces can be removed and the hull turned upside down on two horses, as in Fig. 11.

Various trimming-up jobs must now be done. One of the most important of these is the proper shaping of the chine piece. This must be planed down, Fig. 12, particularly at the forward end, so that it will continue the natural angle of the bottom and side frames, as shown in Fig. 13. Further trimming will also be necessary along the stem and keel rabbet, testing with a 5/8-in. thick piece of wood and cutting out the rabbet accordingly. The deepening of the rabbet to receive the heavier bottom planking commences on a line with the edge of the chine piece.

The bottom planking must be fastened to battens just as the side planking. The same batten material, 5/16 by 1½-in. spruce, is used, and notches for these strips must be cut, as shown in Figs. 14 and 15. These are spaced on 5-in. centers, measuring from the keel out. This 5-in.-apart rule applies to all but frames Nos. 1 and 2. No exact dimensions are given here; the rule is to line up the battens in the rear frames and then allow the sweep of each batten to determine its position on frames Nos. 1 and 2 and on the stem. Be certain, however, that both sides line up at the same position, as shown in Fig. 16. Each batten is beveled at the forward end to fit against the stem immediately behind the rabbet. The ends of the battens at the stern are cut off flush with frame No. 8, as pictured in

Fig. 17. Fastenings for these bottom battens consist of one 1¼-in. No. 6 brass screw at each frame. Galvanized boat nails of suitable length can be substituted if desired. Figs. 18 and 19 show the bottom battens in place—all set for the bottom planking.

The first "skin" on the bottom is easily applied, being merely 8-in. widths of ¼-in. redwood, laid diagonally, as shown in Fig. 20, and fastened with ½-in. copper tacks. Let the edges extend beyond the boat, and then trim later with a drawknife, as in Fig. 21. Fig. 22 shows the diagonal planking in place. Skin No. 2 on the bottom consists of a layer of 10-oz. duck, set in paint, and lightly tacked to the planking. The canvas is first applied, tacked down and then trimmed, as in Fig. 23, so that a small portion of the duck overlaps the rabbet along the stem and keel. "Set in paint" means that the planking is painted first, then the canvas applied, and finally the canvas painted thoroughly so as to force the paint through the duck onto the coating of paint below while the latter is still wet.

These two layers cover the markings which would originally guide you in shaping the outside bottom planks, so the long planks for the bottom must be shaped before the diagonal planking is fastened. "Stopwaters" must be fitted before the final planking goes on. These are merely round sticks of wood, driven into holes drilled through the keel from side to side at the point where the planking meets the joint between stem and keel. The two necessary in this boat are shown being driven into place in Fig. 25. They should be trimmed off neatly to lie flush with the side of the rabbet.

Applying the bottom planking is a repetition of the side-planking procedure. Notice, in Figs. 26 and 27, that the "garboard" plank is fastened with screws the full length of the keel. The outside plank

on each side of the bottom is planed off flush with the side of the chine piece.

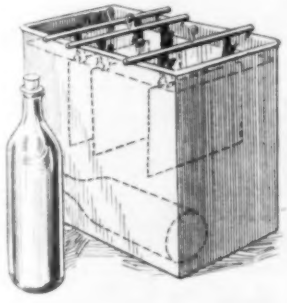
One more plank—the shutter plank—and you're finished. Before fastening this into place, several strands of cotton wicking must be lightly tacked into position entirely around the opening which the plank will cover, as shown in Figs. 28 and 29. The shutter plank is then fitted into place, fastened, and rounded off slightly to conform more nearly to the contour of the boat, as in Fig. 30.

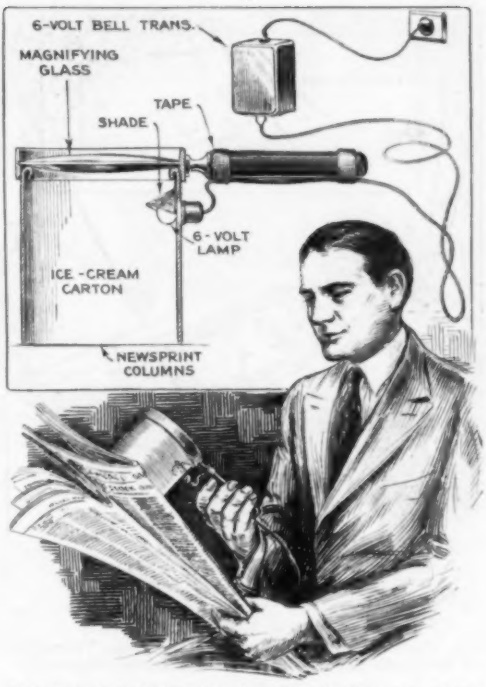
The final operation consists in righting the boat and giving the whole interior a thorough coating of gray paint, fairly thin but containing plenty of oil. Fig. 31 shows how your craft will look by this time. Next month we'll put on the deck, get in the flooring and the two bunks, cut out the transom board and install the motor well.

Then you'll have a complete runabout structure to show for your efforts.

Raising Developing Solution in Tank

When developing negatives by the tank method, the level of the solution is constantly reduced as the negatives absorb some of the chemical, and more loss is sustained through dripping as the work progresses from one tank to another. When the level of the solution gets so low that the top portions of the negatives are not covered, many photographers add more solution. This is, however, not satisfactory, as it changes the strength and consequently the developing time. Merely adding water is also unsatisfactory, as it weakens the solution. A better method is as follows: Get a bottle of suitable size, fill it with water and cork it tightly. Lay this in the solution as shown in the illustration, and this will raise the level. Of course, there must be plenty of space below the plates for the bottle. If a cylindrical bottle takes too much space, get a flat one.—John Edwin Hogg, Akron, Ohio.

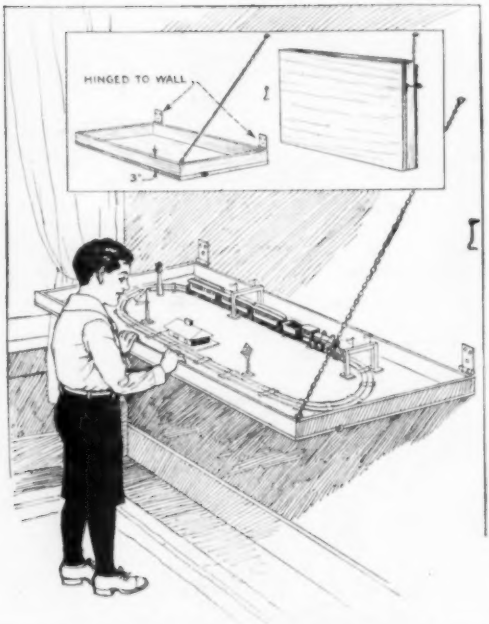




This Illuminated Magnifier Aids Elderly Persons to Read Fine Print and Operates at Practically No Expense

Illuminated Magnifier Aids in Reading

The device illustrated below was made to aid an elderly person in reading. A 3-in. hand glass had previously been used for this purpose, so a paper tube was obtained that would fit tightly inside the rim of this glass. This was cut 4 in. long, which was the proper focal distance for the glass, and lightly cemented inside the rim with shellac. Directly under the handle of the glass a hole was made in the tube, of such a diameter that a small 6-volt bulb could be screwed tightly into it, and a small paper shade was glued over the bulb. Neither light nor shade was large enough to obstruct the field of vision. Flexible cords were soldered to the contacts of the bulb and taped to the handle as shown. The cords were then connected to the output terminals of a bell-ringing transformer, which could be connected to a convenient wall outlet. The light, of course, can be connected to a battery, but with the transformer, the expense is practically none, and the convenience is greater. This device enables a whole column of fine newsprint to be read without any other light.



This Handling of Model Train Tracks Keeps Them Out of the Way, Yet Ready for Almost Instant Operation

Model-Train Track Stand Folds When Not in Use

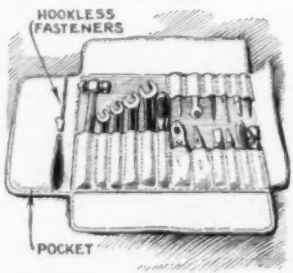
It is somewhat of a problem in the small house or flat to know what to do with the boy's model train and tracks. It is more or less a nuisance for him to set up the whole "works" every time he wants to use them, and, on the other hand, they cannot be allowed to clutter up the floor all the time. The problem was solved in our house as shown. A light platform, sufficiently large to hold the tracks, etc., when erected, was hinged to a convenient wall and supported horizontally by means of a couple of chains. The tracks were fastened to the platform so that they would stay in place, and the platform was provided with a ledge all around, high enough so that the box thus formed would hold most of the rolling stock and other accessories when the platform was folded flat against the wall. Two hooks were provided to keep the box from falling when folded. With this arrangement the outfit was out of the way and yet the system was ready for operation in but a few minutes. In many rooms the platform may be hinged to the chair rail, or to a rail nailed to the studs between two doors. —H. Jackson, Chicago, Ill.

Mounting Photos in Watch Covers

Nearly everyone who has ever attempted to place a photograph in the cover of a closed-face watch, has learned, usually at the expense of a broken crystal, that there is not sufficient clearance between the cover and the crystal for the thickness of the average photographic print. Such a picture, even though it is printed on unusually heavy paper, may be easily reduced in thickness for mounting in the watch cover by the following method: Cut out the picture to the diameter that will fit the watch cover. Wash the hands thoroughly, and then lay the picture, face downward, on a piece of clean blotting paper. Dip the forefinger into a cup of clean water and then gently rub the back of the print. After a little rubbing the paper will begin to soften, and roll up under the finger and flake off. This rubbing should be carefully applied over the whole back of the print. To observe the amount of paper that is being removed, the picture should be held with the back toward the eye, against a strong light. This will reveal the thin places, and further removal of paper should then be confined to the thick spots. In a few minutes, the heaviest print can easily be worked down to such a thickness that it will go into the watch cover without even touching the crystal.

Hookless Fastener Improves Toolcase

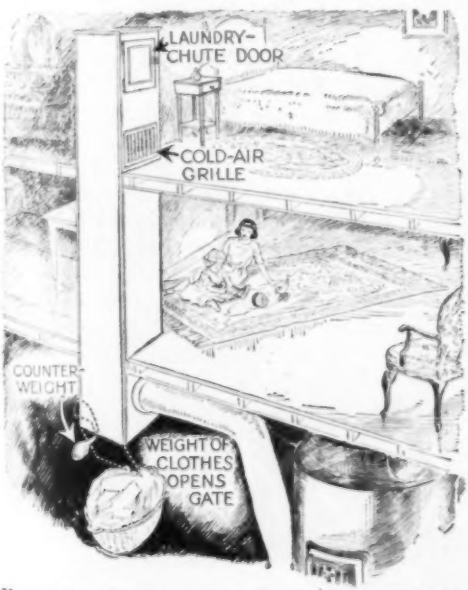
Maybe it is not a good policy to carry all one's eggs in one basket, but it is convenient policy to have all one's auto tools and odds and ends in one case. Rather than keeping extra nuts, bolts, cotter pins, etc., in various loose tobacco cans under the seat, it is much more handy to make a pocket in one end of the tool roll and carry the miscellaneous parts there. A hookless fastener strip will protect the opening so that the smallest washer cannot work out when the pocket is closed. The hookless fast-



ener from an old boot will serve the purpose very well.—Dick Cole, Los Angeles, California.

Altering Clothes Chute for Use as Cold-Air Return

Many homes have an annoying draft of cold air over the stairway. Assuming that the house is well built so that the draft does not come in from the outside, the trouble is most likely caused by cold air descending from upstairs, due to the absence of a cold-air return from the upper rooms. This can be remedied by using the laundry chute, if there is one, for the cold-air return. A grille is set into the chute just above the floor and a suitable sheet-metal pipe connects the lower end of the chute to the cold-air intake of the furnace. The lower end of the chute is closed by means of a flat plate, which is counterweighted and pivoted as shown in the illustration, so that the cold air cannot escape through the open end. The weight of soiled clothes will open this door just long enough to allow the clothes to drop out. This method eliminated the draft on the stairway completely, whereas closing off the stairway would have prevented the heat from ascending.—R. F. Starzl, LeMars, Iowa.



How a Laundry Chute May Be Used as a Cold-Air Return to the Furnace

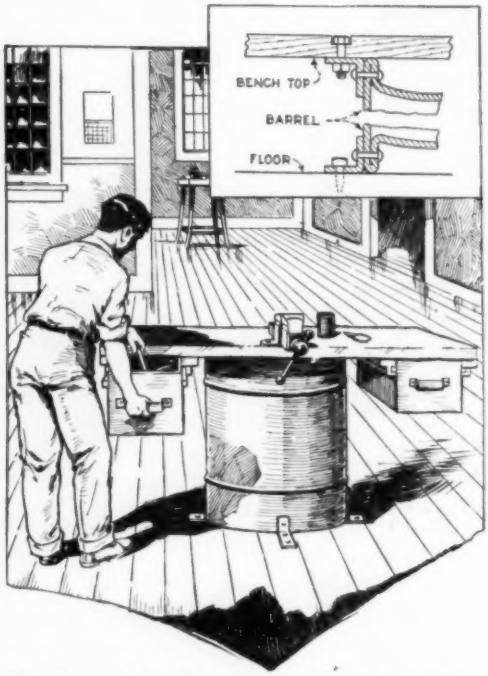
Making the Car Hoist Itself "by Its Own Bootstraps" Is Easy If Some Rope Is Available and the Car Has Long Hub Caps

Car Hoists Self from Ditch

Many cars can be made to act as a power windlass to pull themselves out of mud or from a deep ditch. All that is necessary is 40 or 50 ft. of rope, and hub caps long enough to serve as the drum of the windlass. The ends of the rope are fastened to the spokes of the rear wheels, then a turn is taken around the hub caps, and the bight of the rope is made fast to any convenient solid object, such as a fence post, either in front of or behind the car, depending upon which direction the car is to be moved. When the car is started in low gear, the rope will wind on the hubs, and the car will creep slowly but surely in the direction of the bight of the rope. When the hubs are full of rope, the car must be locked with the hand brake and the wheels blocked to prevent slipping back. A new "bite" can then be taken with the rope, and the process repeated until the car is on solid or level ground. The average hub cap will hold from 1 to 2 ft. of ½-in. rope.—N. W. Hedrick, Willapa, Wash.

¶To remedy or decrease excessive perspiration of the feet, try the following method: Add a thickness of leather to the heel of the shoe, thus raising it and thereby throwing more of the weight on the ball of the foot.

Oil Drum Makes Good Bench Support

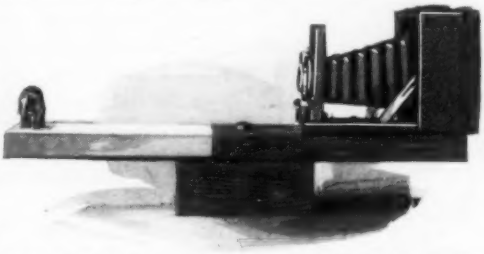


Steel Drum Makes Cheap and Sturdy Support for the Shop Bench

Providing the desired rigidity at a minimum of expense, an old oil drum has been found handy as a bench support. Heavy angle brackets are welded to the top and bottom edges of the drum, to permit attachment to the top and to the floor by means of lagscrews. The top is made of 2-in. stock, preferably hardwood, securely bolted to cleats. If desired, a drawer can be provided at each end as shown.

Swinging Camera Holder

For making interior photos of small objects, I have found the swinging holder on which both camera and object are mounted, of considerable usefulness. The holder consists of a piece of 1-in. board, pivoted to a block by means of a bolt. The camera is set at one end and the object to be photographed at the other. Good results were obtained by turning the camera toward the window and making part of the exposure, after which the holder is turned around in just the opposite direction, taking care not to move either camera or object, and the rest of the exposure is then made. In this way all surfaces of the object are fully illuminated and the direct light of the window during the first part of the exposure eliminates all traces of a background.—H. Moore, Hamilton, Can.



Pivoted Holder for Camera and Object Helps Make Good Photos

Restoring Finish of Nickel Ware

Nickel fixtures that have a deep-gray appearance or have turned to yellow as if stained, can be restored to their original brightness by immersing them in a bath consisting of alcohol and sulphuric acid. The proper proportions are of the utmost importance. Be sure that the sulphuric acid does not exceed 2 per cent of the quantity of alcohol. After remaining in this bath for about 20 seconds, remove the articles and rinse them in a bath of clear alcohol, after which they are rubbed dry with a piece of cheesecloth.

Mounting Tracings on Muslin

Tracings mounted on muslin will give long wear and are more satisfactory in handling than the unmounted drawings. The method of mounting them is as follows: Stretch a piece of starched muslin, slightly larger than the drawing, on a flat, smooth board, fastening it with tacks. Coat the back of the tracing with a good varnish, and place it, face down, on a flat surface so that it may partly dry and become tacky, which usually takes two hours. Place the tracing upon the stretched muslin, varnished side down, and lay a smooth sheet of wrapping paper over it. Using a moderately warm flatiron, and beginning at the center of the tracing, iron toward the edges, applying moderate pressure and avoiding wrinkles.

Holding the Windshield Wiper Out of the Way

Motorists who are annoyed by having the blade of a windshield wiper sagging down to a vertical position, where it obstructs the vision, will appreciate a simple method of keeping it up out of the way. A small rubber vacuum cup, of the kind used to hold ash receivers and other articles to smooth surfaces, is placed on the outside of the windshield to hold the wiper blade up above it. Another method is to cement a small piece of thin rubber to the outside of the glass with shellac. It should be placed high enough to prevent the blade from striking it while the wiper is in operation, but so that the blade can be slipped over it with the hand lever when the wiper is not in use. If the rubber is correctly placed and not too thick, there is no need to get out of the car to fasten or release the wiper blade. Still another method is to place a short piece of ¼-in. tubing inside of the car so that the lever, which is intended for hand operation, may be slipped into the end of the tube and held there.—H. C. Roberts, Urbana, Ill.

Large Road Map Painted on Garage

As a help to the many tourists who go through the Rio Grande valley in Texas, a large road map was painted on the front of a garage, as shown in the photo, and

Large Road Map Painted on a Garage Saves the Tourists' and the Garage Attendants' Time

the lettering was made large enough to enable tourists to read it at a distance of 25 ft. Besides being a distinguishing feature for the garage, the map saved the time spent by employes giving information on roads. It also saves the tourist's time.—L. E. Litton, Lincoln, Nebr.

Auto Chair for Children in the Barber Shop Helps Bring in Trade

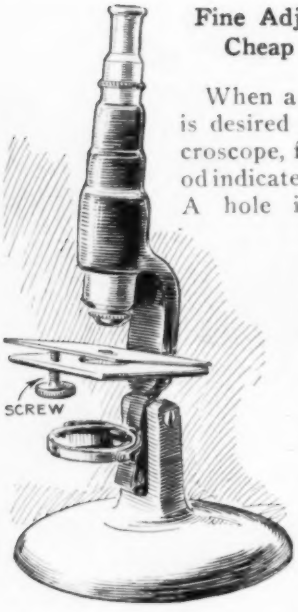
Children's Auto Chair for the Barber Shop

To make a barber shop a place where the children like to come, get a child's auto and mount it on a revolving pedestal as shown in the drawing. The pedestal shown here rotates at the bottom, making it possible to brace the car near the front. Many children dislike haircutting, but this auto chair, by occupying their attention, makes them forget the operation.—Walter W. Uhlman, Buffalo, N. Y.

Sandpapering Square Edges on Small Machine Bases

The woodwork of small electrical or experimental machines and devices often detracts from the workmanship because proper care is not taken in finishing the edges. To smooth off the ends of a small baseboard squarely, proceed as follows: Square up a piece of 2 by 4-in. stock, 1 ft. long; place a flat sheet of sandpaper on the bench and set the 1-ft. block on top of it, holding it in place with the left hand. Hold the piece to be squared up firmly against the block and rub it on the sandpaper. A square edge of smooth finish will result. The edges should, of course, be planed as smoothly as possible before sanding in this way.

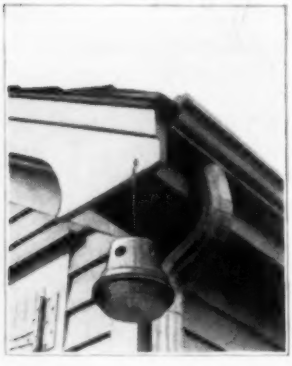
Fine Adjustment for a Cheap Microscope



When a fine adjustment is desired for a cheap microscope, follow the method indicated in the drawing. A hole is drilled and tapped in the table, near one side, for a thumbscrew having a very fine thread. The specimen plate is laid on the table with one edge over the end of the screw, which, when turned, raises or lowers the plate, and thus gives a delicate adjustment.—Henry Wallace Phillips, New York City.

Wren House Made from Flowerpot

Provided with a suitable bottom, an inverted flowerpot, suspended from the eaves of the garage, makes an unusual wren house. Get a medium-size pot and saucer and a length of wire. Make a 1-in. hole through the side of the pot, about 2 in. from the bottom. This can be done by means of a hammer and a small cold chisel, tapping lightly and turning the chisel between your fingers as the hammer is used.



Once the hole is cut through, you can easily chip or file down the edges to make them fairly smooth. There must also be a small hole through the center of the saucer. Make a knot at one end of a length of wire and slip the saucer, right side up, over the wire, turn the pot upside down, and run the wire through the drain hole. It is then an easy matter to fasten the wire to a nail driven into one of the projecting rafters of the garage. Being well sheltered and protected by the overhanging eaves, this wren house will soon be occupied.—Dale R. Van Horn, Lincoln, Nebraska.

Muffler for the Doorbell

When the ringing of a doorbell is excessively loud, cut off a ½-in. length of rubber tubing that will fit snugly on the ball of the clapper. While this method will not silence the bell entirely, it will muffle it sufficiently to be less annoying, especially when there is a sick person in the house.—Thomas Blaine, Evanston, Ill.

Strap Handle for Starter Button on Car

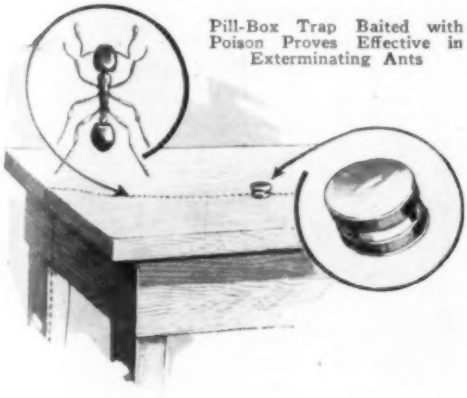
Many new automobiles are equipped with a starter button on the instrument board, but this usually is hard to grasp. A good handle can be improvised by using a suspender strap, both loops being slipped over the starter button as shown. In the absence of a suspender strap, get a strip of strong leather, about 11 in. long, and cut a slit at each end to a force fit over the button.

Emergency Aid for a Wet Watch

Almost everyone has had the experience of dropping or holding a watch in water, entirely unintentionally of course. The consequences of such an immersion are likewise well known. If this ever happens again and it is impossible to get the watch to the jeweler immediately for a thorough cleaning, remove the works and place in a dish of kerosene, which will prevent most of the corrosion due to contact with air. Although this treatment will not prevent all rust, it is about the best procedure.

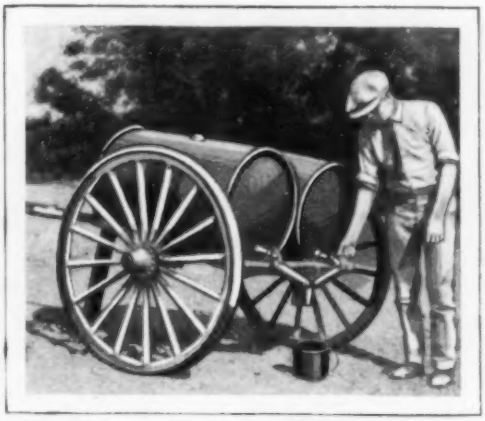
Pill Box Makes Good Ant Trap

By removing the top and cutting three or four small holes in the side, an ordinary cardboard pill box makes a very effective ant trap. There are a number of good baits that can be used, any of which should clean up a colony of ants in a few days. This trap is especially intended for little red ants, sometimes called "Pharaoh's ants," which are so fond of sugar and other sweets about the kitchen. Before using the pill box for this purpose make it watertight by pouring in a small amount of hot paraffin. In use, the top of the box is partly raised to allow the ants to enter through the holes and, when not in use, the lid is pushed down to cover the holes, eliminating the danger of pets getting at the poisoned bait inside. An effective bait can be made by dissolving 2 oz. of sugar in a pint of water and adding ¼ oz. of tartar emetic. Pieces of bacon rind with small quantities of tartar emetic worked well into them also make a good bait. A good poison sirup can be made by dissolving 4 oz. of sugar in ½ pint of water to which sodium arsenate, 30 gr., and a small amount of honey is added. Boil and strain this mixture but be careful not to inhale any of the fumes, which are poisonous. When a sirup is used in the pill box, half fill it with small bits of blotting paper and pour the sirup on the paper. Never keep large quantities of poison sirup on hand, and be sure to label the container "poison," keeping it well out of the reach of all persons unfamiliar



Pill-Box Trap Baited with Poison Proves Effective in Exterminating Ants

with its use, particularly children.—E. C. Moore, Washington, D. C.



Two Oil Drums, Mounted on Two-Wheeled Frame, Make a Handy Fuel Tender for the Tractor

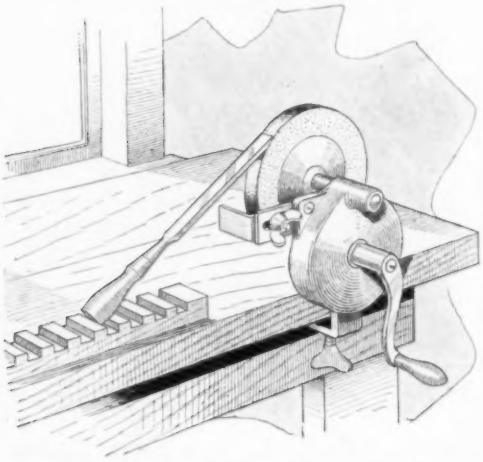
Handy Fuel Tender for Farm Tractor Made from Odds and Ends

For keeping fuel handy, the illustrated tractor tender has been found highly useful. Two 50-gal. drums are mounted on a frame built on an old buggy axle fitted with suitable wheels. The frame joints are made strong by using strap-iron angle brackets. There is a short piece of 2 by 4-in. stock hinged to the frame at the front, to serve the purpose of a leg, which can be dropped down to hold the tender level when it is set away. Gasoline, kerosene or oil can be drawn from either barrel through a central outlet, which is made of tin tubes, soldered and shaped as shown, and connected to the taps.

Flashlight Helps to Distinguish Shades

While it is usually difficult to distinguish two shades of cloth, yarn or thread, that nearly match each other, the difference can readily be seen when the rays of a bright flashlight are thrown over both at the same time. Two skeins of yarn of slightly different shade were placed side by side directly in front of a strong gas lamp, but it was impossible to see the difference. Upon turning our backs to the light and holding a flashlight on them it was immediately seen that one was lighter than the other. When I work with cloth, especially when it is necessary to match closely, I always keep my flashlight handy for this purpose.—Hazel Strosnider, Onaga, Kans.

Simple Grinder Jig Holds Tools



Simple Attachment for Hand Grinder Keeps Tools at Constant Angle While Grinding

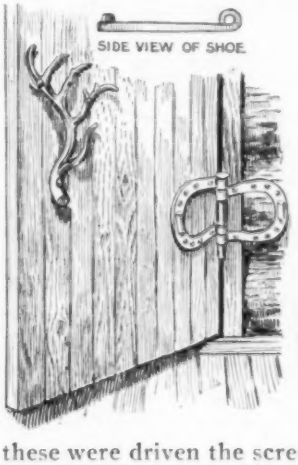
In the ordinary hand grinder, useful as it is, the arrangement supplied for holding tools at a constant angle to the wheel leaves much to be desired, although this is necessary for good tool sharpening. The simple arrangement shown in the drawing does the job well, costs nothing to make and can be fitted in a few minutes. A notched strip, about 2 in. wide, is tacked to the bench in front of the wheel, and the end of the handle on the tool being sharpened is merely set in an appropriate notch. It is more convenient, in some cases, to attach both strip and grinder to a separate plank, which may then be clamped to the bench when needed, and removed afterward, leaving the bench clear for other work. This is a very simple rig, but once used, always used.—S. E. MacNair, Rio de Janeiro, Brazil.

Finishing Glossy Photographs

Though the professional photographer knows better, many amateurs continue to struggle with the solution of benzol and paraffin on their ferrotype plates, to obtain glossy prints. Benzol in combination with paraffin, or other greases, is often unreliable and is the cause of many smudgy, dust-specked prints, unjustly blamed on unclean plates. The amount of paraffin is another bothersome matter, for should too much be used the print never will come off. A solution of plain commercial acetic acid will give good glossy prints, and is much more satisfactory to use than the old-time mixture mentioned. Plates that have been used with the old benzol solution are cleaned by rubbing with a tuft of cotton soaked in alcohol or gasoline. A solution of 1 oz. acetic acid to 10 oz. of water is sprinkled on the plate, rubbed in with a piece of cotton, and wiped off with a cloth. The plate should then be polished by rubbing with a piece of dry cotton. After the prints have been fixed and thoroughly washed, they should be placed in a bath composed of 1 oz. acetic acid to 16 oz. of water, and allowed to remain for about 10 minutes. Before placing the prints on the ferrotype plate, they should be wiped off with a tuft of cotton, under running water. By this method, prints dry before a fan, or in a draft, in less than five minutes, if well blotted, while 20 minutes is quick time for "peeling" a print when the benzol solution is used, and, in addition, there is always the risk of spoiling a print, due to the emulsion sticking.

Horseshoes Form Attractive Hinges for Summer Cottage

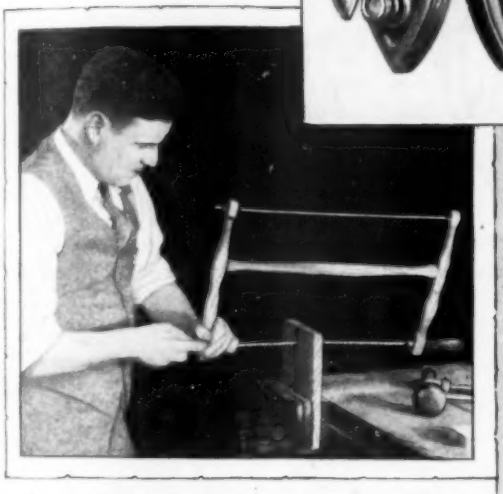
Picturesqueness even in minor details has been achieved by a friend of the writer's in the construction of his lake-shore cottage. The hinges of the doors are made of horseshoes, each shoe forming half of the hinge. Worn shoes were selected for size, heated and the ends drawn out and turned, forming eyes through which ¼-in. bolts were passed to serve as pins. Door handles are made of deer horns, the natural curve forming the hand grip. Holes were drilled at each end, through these were driven the screws that hold the handle to the door.—W. H. Hoeft, Spokane, Wash.



Wall Fixtures to Match Your Woodwork

By C. J. HUBBARD

EXECUTED in walnut to match the woodwork of the room, the wall lamps shown in the illustrations vary considerably from commercial designs. By using the type of lamp indicated (mazda X-16½) the armorial effect of the shield or plate is increased.



Distinctive **Wall Lamps Having an Armorial Shield of Walnut to Match the Woodwork**

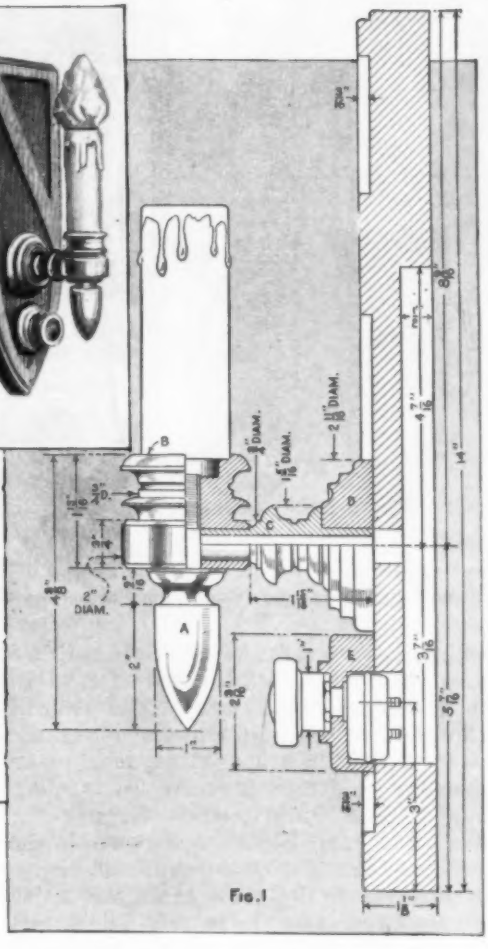
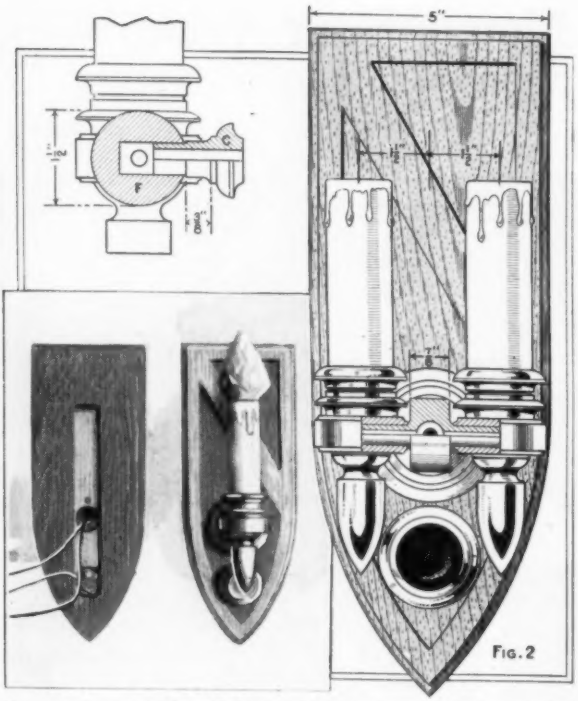


Fig. 1

Piece A, Fig. 1, is turned as shown, leaving a pin ½ in. in diameter for fitting into piece B. The direction of the grain should be with the 2⁹⁄₁₆-in. dimension. Next, piece B is turned, using the chuck to recess for the candle drip. Drill a ½-in. hole clear through it and fasten a short piece of fixture pipe in the hole, using iron cement. Permit the pipe to extend sufficiently to allow a candle-holder socket to be screwed onto it, and drill a ½-in. hole in the side in which the piece C is to be fitted. The grain should run in the direction of the 1¹³⁄₁₆-in. dimension. To make piece C, drill a ¼-in. hole with the grain running through the entire piece. Slip a ¼-in. dowel rod into the hole, center in the lathe and then turn to the shape indicated, leaving ½-in. ends for fitting into piece D and the shield. Piece D is turned on the faceplate.

For the shield, a piece of nicely grained hard walnut is used, preferably a close-grained burl. This piece should measure 14 in. long by 5 in. wide when finished. After the blank shield is cut to shape, bead around the edges as indicated, using a hand router, chisel or shaper, cutting to a depth of ³⁄₁₆ in. If a hand router or chisel is used, round the square edges with sandpaper. Rout out the face of the shield, ³⁄₁₆ in. deep, with a hand or machine router and finish with fine sandpaper. Reverse the piece, drill a ¼-in. hole, then drill and cut it out for a switch. The



Front View of Single and Double-Light Fixtures Showing Method of Wiring Them

switch used is a radio model, rated at 3 amp., 220 volts. Finish the recess to 1 1/16-in. width and ½-in. depth. The piece E should have its grain running along the narrow side. Turn a blank, 2 3/16 in. in diameter, and then a recess, 7/16 in. deep and 1 1/16 in. in diameter. Reverse the work and turn the face and recess in the switch knob. Throw the chuck off center 3/8 in., reverse the piece again and finish the back recess for the switch. The switch used in this design is Pilot radio switch No. 44, rated at 3 amp., 220 volts. The ordinary toggle switch can be used but not with the same decorative effect.

Pieces D and E are then fastened to the shield with wood screws extending into them from the back. If a double-light fixture is desired, two extra pieces are necessary, one similar to C and therefore called C_1 and the other F. The only difference between C and C_1 is that the dimension of the latter is 3/8 in. To make piece F, drill a ¼-in. hole with the grain running through the piece, and proceed to turn as in case of C. Then drill a ½-in. hole through the side for fitting C_1. Assemble the pieces in the following order after wiring the candle holder: B, A, C, D and then the shield. Now E is attached to the shield. In case of the double-light fixture assemble as follows: B, A, F, C_1, D and then the shield, after which E is attached to the shield.

Finish the wood before assembling all the pieces together except the shield and E. The latter two pieces are given four coats of flat varnish or its equivalent; oil and powdered pumicestone and then rottenstone are used to obtain a piano finish. Walnut stain may be used or the wood may be left in its natural finish, as the maker pleases.

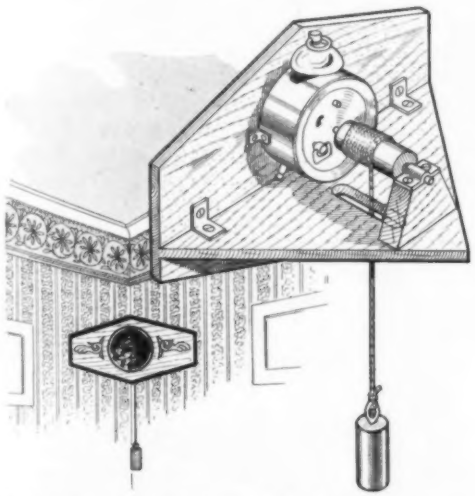
Hammer Attachment Starts Nails Out of Reach

Many times a nail must be driven at points that can be reached only with the hammer, and then it is a problem how to start the nail because you cannot use the left hand to hold it. This trouble can easily be overcome by providing the hammer with a nail holder made from a piece of clock spring as shown in the drawing. A 2-in. length is heated to remove the temper. Two holes are drilled at one end and a V-shaped notch cut at the other to take the shank of a nail. Then the temper must be restored, which is done by heating the piece to a cherry-red and quenching in oil, after which the spring is brightened with sandpaper or steel wool and again heated, but this time to a straw color. At this point, it is again quenched. This gives the spring hardness and flexibility. Attach it to the end of the ham-

mer handle with two small wood screws, so that the notched end projects over the flat portion of the head as indicated. A nail slipped in the notch will be held securely. If desired, spring brass can be used instead of the clock spring.

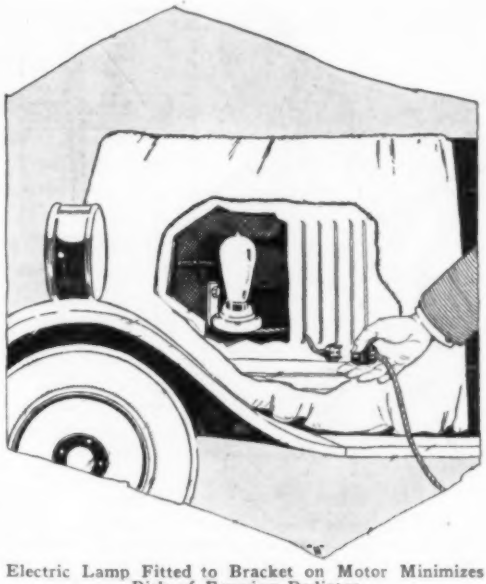
Old Alarm Clock Makes Corner Timepiece

Excellent time is kept by the corner clock shown in the drawing, which consists of the works of a discarded alarm clock. The spring was removed, and a 5-in. shaft was substituted for the spring shaft. On the back end, which projected about 3½ in. from the mechanism, a wooden drum was attached, about 1 in. in diameter and 3 in. long. The front end of the shaft was filed square to take the winding key through the face of the clock. A weight of about 2 lb., or just enough to give the clock a good tick, was hung on a flexible steel cable, wound around the drum a few times. The length of time between windings, of course, depends on the length of the cable and the height above the floor. An attractive face of polished mahogany with light-colored figures can be sawed out with a scrollsaw, and suitable brass ornaments can be added. As the winding drum projects a few inches at the back of the clock, the best location



Old Alarm Clock, with New Face and a Winding Drum, Makes Attractive Corner Timepiece

for it is in a corner.—R. Huddlestone, New Westminster, Can.



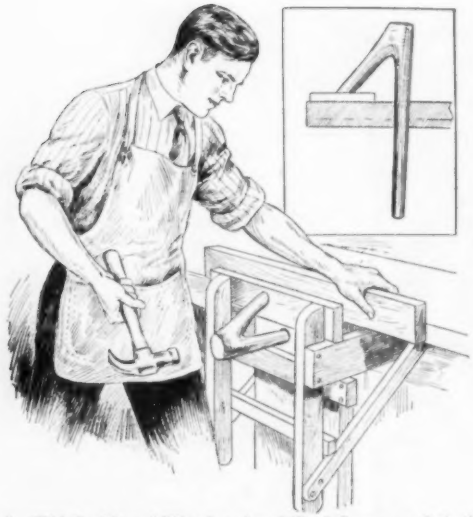
Electric Lamp Fitted to Bracket on Motor Minimizes Risk of Freezing Radiator

Lamp Prevents Freezing of Radiator

By inserting an electric lamp under the hood of your car and then covering both radiator and hood with a heavy blanket or old comforter to prevent the escape of the heat, the risk of freezing the radiator is greatly reduced. It will be found rather inconvenient, however, to run an extension line under the lower edge of the hood and to hang the lamp on the motor. It is much better to provide a flat-iron bracket to which a lamp receptacle is attached, the bracket being fastened to the motor permanently as shown. A length of lampcord is wired to the receptacle, the other end being slipped through one of the ventilation slots and fitted with a plug for quick connection to an extension cord. The lampcord from the receptacle to the plug should be long enough to allow the hood to be raised.—K. M. Coggeshall, Webster Groves, Mo.

Pilot Light on Gas Stove Keeps Water Warm

When the gas stove is not in use, set a tea kettle of water over the pilot light. Enough heat is produced by the pilot light to keep the water warm. It will then take less time to bring the warmed water to a boil.—Chas. S. Soddons, Sr., Alden, Pa.



An Old-Fashioned Woodworkers' Tool Serves as Substitute for a Vise Screw, and Proves Just as Satisfactory

"Barilette" Serves as Vise Screw

The "barilette," while little known on the modern workbench, is an exceedingly handy tool, and a valuable aid for holding boards flat on the bench while working them. In its simplest form it is a fork of wood or iron, one leg of which is dropped through a hole in the bench top, as shown in the detail, while the other leg rests on the work. A sharp tap on the head of the fork wedges the barilette and holds the work firmly. Iron barilettes are sometimes fitted with a refinement in the form of a screw-tightening arrangement, which, while adding to the cost, does not greatly increase the usefulness of the tool. This form is that known to wood carvers as a "hold-down." The writer prefers a wooden one, made from the tough fork of a tree, to any form of iron tool, as it is lighter to handle and lower in cost. The longer limb should be about 1⅜ in. in diameter, and the holes in the bench made with a 1½-in. bit. The larger drawing shows an unusual application of the barilette, in which it is used as a substitute for a screw in the bench vise. A tap on the end of the barilette tightens it, while an upward tap below the outer end loosens it. This contrivance provides an instant grip, which many quite expensive vises fail to do in practice simply because their parts cannot work freely enough.—S. E. MacNair, Rio de Janeiro, Brazil.

Umbrella Makes Folding Minnow Net

A party of campers forgot their minnow net. A satisfactory substitute was made from an old umbrella frame and mosquito netting. The wire holding the ends of the rib braces to the small ferrule was cut, and the braces were pulled free. A piece of mosquito netting with a small hole cut in the center was slipped over the handle. The rib braces were held upright and the netting was pushed over them, one at a time. A stout string was tied around the outer edge of the ribs, to prevent their spreading. The edge of the netting was turned over and sewed to the string and also to the ribs. A pole is attached to the umbrella handle for use when catching minnows in deep water.

Making Leather Lacing

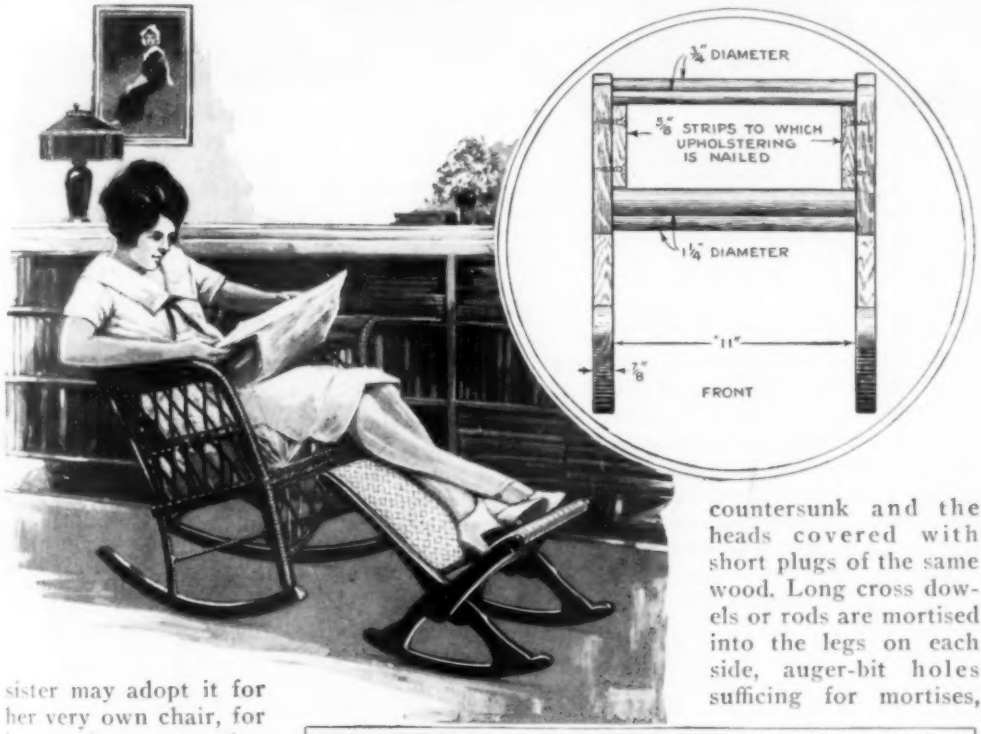
Leather lacing can be easily and quickly made from odd bits of leather in the following simple manner. Cut a piece of leather in as neat a circle or "fat" oval as the shape of the piece permits. Then from a piece of wood make a gauge with a piece cut out the thickness of the leather and a small notch for width, as shown. Stick the point of a sharp knife blade into a bench and hold the gauge with the notch against the back of the knife. Cut a piece from the edge, of the proper width, start it through the gauge and pull. A very neat lace is the result. The tops of worn-out hiking boots, and the like, make ideal belt, snowshoe or heavy boot lacing. From finer material lacing can be made for binding billfolds and other leather goods.—E. L. MacFarlane, Fredricton, New Brunswick.

Disk of Leather, a Short Piece of Wood and a Knife Are All That Is Necessary to Make Neat Lacing

OLD ENGLISH GOUT REST IS PRACTICAL FOR HOME

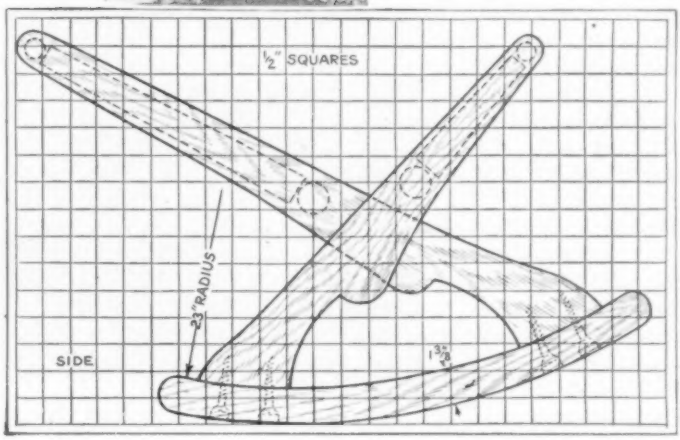
By H. L. WEATHERBY

THE FOOT and leg rest illustrated here is the copy of a genuine antique, the original of which came from England over a hundred years ago. It makes a reclining chair, or "chaise longue," out of the ordinary easy chair, and it is so much more comfortable than the ordinary footstool because of its adjustable positions. It will entertain the children, and little sister may adopt it for her very own chair, for its sturdy construction will stand the strain of children's use.



The original piece was made of oak. Any good hardwood may be used, however, and if black walnut is available, there is no other wood more satisfactory or beautiful. Patterns for designs of the legs should be laid out according to the squared drawing and transferred to the wood, after which the pieces are cut out on the band or jigsaw. Lacking power equipment, these pieces may be shaped with turning or coping saw by hand.

The half-lap joints, holding the leg sections together, must be very carefully laid out, cut, and the parts glued together and further reinforced with short heavy screws from the inside. These screws should be countersunk and the heads covered with short plugs of the same wood. Long cross dowels or rods are mortised into the legs on each side, auger-bit holes sufficing for mortises,



and the whole frame is thus glued together and clamped with bar clamps. Hardwood rods must be used, but they need not necessarily be high-grade stock.

Left, Foot and Leg-Rest Frame with Webbing Tacked in Place; Right, the Burlap Backing Being Covered with Padding

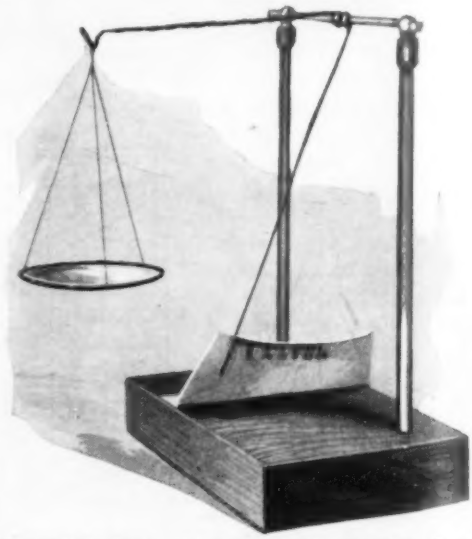
Most home craftsmen look upon upholstery as an art too difficult for them to undertake, and when they have a job of it to be done, they send it out rather than try it themselves. The upholstering of this particular piece, however, is very simple, and no one need be afraid to do it. Briefly stated, the process is as follows: Tack webbing crossways and lengthwise, stretching it tight and weaving as shown in one of the photos; stretch burlap bagging or other coarse strong cloth over the webbing and tack around the edges, on the nailing strips; pad with cotton, being careful to keep a smooth even job that tapers off to the edges. Next cover the cotton with another piece of the bagging, stretched tight over the padding, tack, and then stitch through the cotton with a long needle and heavy waxed cord to hold the cotton padding in place.

Lay a very thin layer of cotton over the stitched bagging and cover this with the tapestry. This thin layer gives a smooth feel and appearance to the finished job. The tapestry cover is also stretched very tight and tacked all around to both the front and back sides. All padding, of course, is done only on the front side, that is, above the webbing, and all tacking, up to the present stage, is done with ordinary 6 or 8-oz. carpet tacks.

Stretch a suitable gimp around the edges of the tacked tapestry and across the joining places of the two ends, which should come on the bottom sides of the middle dowels. Tack it on with small-headed tacks called gimp tacks.

Improvised Balance for Experimenter

When a fairly accurate balance is not available, one can readily be improvised. The type shown in the drawing depends on the twisting of a wire, the degree of twist being proportional to the force applied, which is exerted by the weight. In this case, an old watch cover served as the

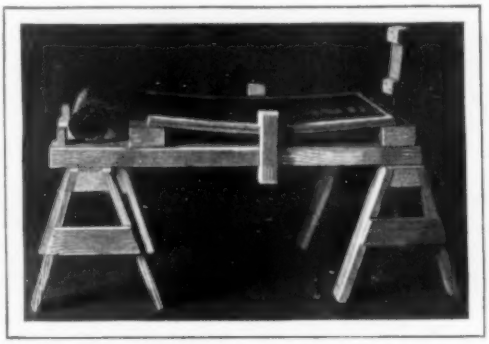


Improvised Scale Using a Torsion Member Gives Accurate Weight

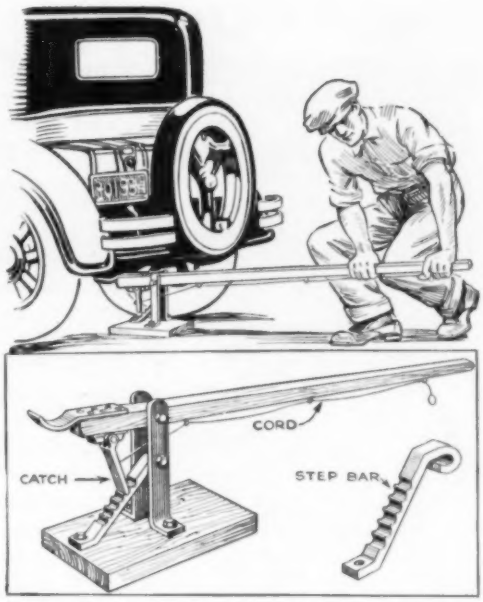
pan, although any similar metal pan of light weight could be used. Three equidistant holes were punched near the edge for lengths of thread which were tied together at their free ends and suspended from a length of iron wire, this being wrapped around the torsion member. The latter consists of part of a watch main spring, and is held securely on two vertical supports by means of the ball ends of curtain rods, which are driven on the end of the supports, the holes being flattened to hold the spring tightly. The other end of the iron wire, which forms the beam, is bent down to serve as a pointer. The vertical supports are set into holes drilled in a wooden base, which also holds a scale consisting of a piece of cardboard, bent and tacked on and properly graduated. This is done by placing standard weights in the pan and marking the cardboard at the points indicated by the pointer. If a set of standard weights is not available, nickels can be substituted. A new nickel weighs 5 grams, or slightly less than ⅙ oz. Two nickels weigh ⅓ oz., and so on. The distance between these marks is then divided as finely as desired. The scale shown in the photo has a capacity of a little more than 2 oz. and was found accurate to about 10 grains or ½ scruple.—H. N. Durham, Washington, D. C.

Getting Screen Wire Tight

When about to re-cover window screens, a good job will be assured if you follow the illustrated method of stretching the screen. Two wooden clamps, each consisting of a short piece of 1-in. stock with 2-in. blocks nailed to the ends, are used to hold the sidepieces of the frame in a slightly bowed position. Then the screen is tacked to the ends, after which the clamps are removed and the rest of the screen tacked in place. The spring of the side members will draw the screen tight. Two saw-horses with crosspieces will facilitate the work.—Henry Dean Hoose, Akron, Ohio.



Outfit for Stretching Screen on Window Frames



Homemade Auto Jack of the Quick-Acting Type Is Handy around the Garage

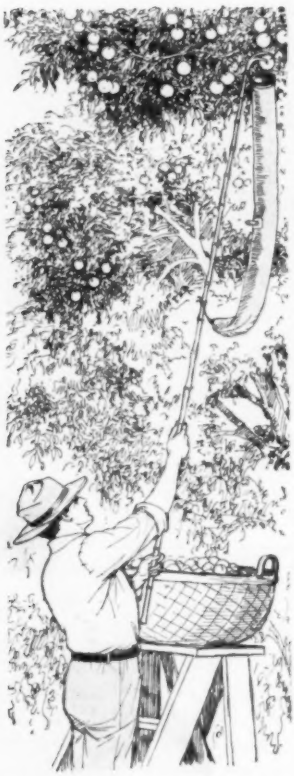
Quick-Operating Auto Jack

Any car owner can make the jack shown in the drawing. It consists of a hardwood handle, faced with a heavy metal bar at one end to take the load, and pivoted between two flat-iron brackets that are bolted to a hardwood base. A catch pivoting on the underside of the handle engages with a notched bar, and a cord enables the user to pull the catch back into any desired notch.—Chas. H. Willey, West Concord, N. H.

Coconut Shell Makes Aquarium Grotto

A coconut shell can be made to serve nicely for an aquarium grotto in a very simple manner. Saw the shell in two, sandpaper both inside and outside, burn a small hole in the top and cut four holes in the bottom edge, large enough to admit the fish. Finish by varnishing thoroughly, applying four coats of varnish and drying between coats.

Fruit Picker Made from Inner Tube



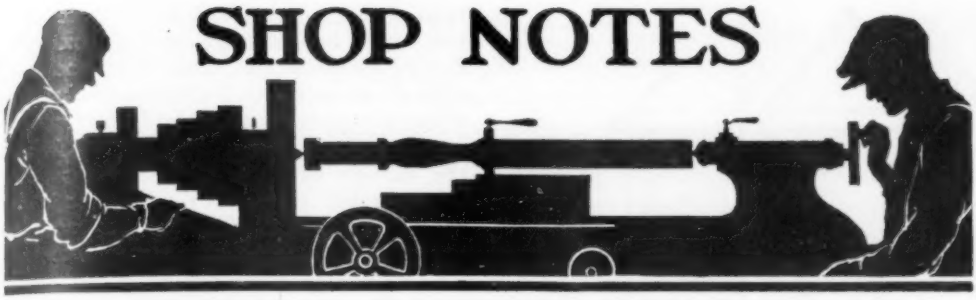
When fruit has to be picked from the top branches of a tall tree and the ladder isn't long enough to enable the worker to get at them, the fruit picker shown in the illustration will be found handy. Get a long bamboo fishing pole and attach a two-prong hook to the end in order to get a grip on the fruit when pulling it off the branch. Heavy galvanized wire is bent to form a suitable ring for holding the open end of an inner tube directly under the hook, with just enough space between the two to accommodate the fruit. The lower end of the inner tube is tied onto the pole as indicated so that the fruit cannot fall out. In use, the section of inner tube is filled, after which it is a simple matter to empty it.—A. H. Waychoff, Phoenix, Ariz.

Staining and Varnishing

A stain and varnish job is preferable to paint for many interior jobs. Staining is easy and a coat of good varnish over it provides a harder surface than paint. Frequent repainting of an interior can be avoided if stain and varnish are used, and when the surface needs freshening up, another coat of varnish will do it. Three operations are necessary, whether the old finish is paint or stain: first, smoothing down the old surface with No. 1 sandpaper; second, dusting off the sanded surface well and applying a coat of stain and leaving this standing about two days in order to dry hard. If any of the old surface shows through, a second coat of stain must be applied and allowed to dry in the same way. Third, apply one or two coats of any good interior varnish allowing sufficient time between coats for drying. Bear in mind, if you desire a finished job that is smooth and free from lumps, never to put on a second coat unless the previous one is thoroughly dry and has been lightly sanded with No. 00 sandpaper to remove all dust and air bubbles from the surface. After the last coat of varnish is dry, rub the surface with upholsterers' hair to get a hand-rubbed finish. Do not mix your own stains unless you are familiar with the work, but get the colors ground in oil. This is a soft putty-like substance and must be thinned to the proper consistency with turpentine, after which a little japan drier is added. A 1-lb. can of color, ground in oil, will then cover the woodwork of the average-size room. When dry, rub off the surface with a rag dampened with turpentine, in order to remove all the oil, and apply one or more coats of good varnish, allowing at least 36 hours between applications.

Handle for the Vacuum Bottle

Vacuum bottles, especially those of the larger sizes, are rather unhandy to carry owing to the absence of a handle. The lack can readily be supplied by slipping two narrow, flat bands of sheet metal around the bottle as shown, the ends being bent and drilled to receive small screws. The grip, consisting of a short curved rod drilled at both ends, is fitted between the bands, screws holding the entire assembly together and drawing the bands tight so that they will not slip off.



Lantern Illuminates House Numbers

By A. C. ULLRICH

THE TROUBLE usually encountered when one's friends come looking for the house after dark can all be eliminated, and, in addition, the entrance to the house beautified if the combination lantern, number plate and push button shown in Fig. 1 is constructed. Although presenting a rich and handsome appearance, the job is really a simple one for any home owner who is at all handy with tools. Full-size blueprints of the design and all parts are available, and the complete materials can be purchased for a small sum.

The materials necessary are: One aluminum sheet, ⅛ by 6½ by 16⅜ in.; two pieces ½-in. brass angle, 1/16-in. stock, 27 in. long, one piece 4¾ in. long; one piece 26-gauge brass, 3¼ by 4¾ in.;

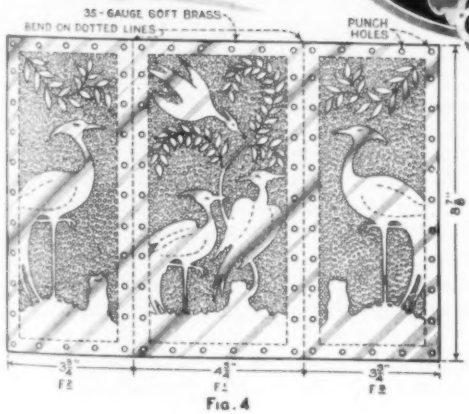


Fig. 4

one sheet 35-gauge brass, 12¼ by 8⅞ in.; one piece 26-gauge copper, 6¼ by 9 in., one piece, 16⅜ by 1 in.; two pieces brass tubing, 7/16 in. long, ¼ in. outside diameter; one standard porcelain light socket; one

FIG. 5

bell button, and light switch, wire, copper rivets and round-head brass machine screws with nuts.

Lay out the back of the lantern on the aluminum sheet to the shape shown in the drawings and photos, by making a paper pattern of half the design, if you have not the blueprints, doubling the paper along the center line, Fig. 8, and cutting out both halves at once. Use the pattern to transfer the design to the metal, then cut out with a scrollsaw. In laying out the pattern, be sure to leave plenty of space for your house number on the bottom of the back plate. File and polish the edges. Drill holes of the sizes marked in Fig. 11.

The perforated sides of the lantern, Fig. 4, may now be made. These look difficult to make, but in fact are simplicity itself. The three sides may either be made in one piece and afterward bent U-shape, or they may be made separately and soldered into place in their individual frames, as indicated in Fig. 10. In any event the method of getting the design is the same. The 35-gauge soft brass is used. Lay out the design and trace onto the brass, keeping the design inside the dotted lines shown. Lay the panels on a block of soft wood and punch through with a common wire nail, hammering lightly and uniformly. It is best to follow the outline of the design first, as indicated in Fig 6, then to fill in the background punchings. The effect secured by this simple means is very lacelike and

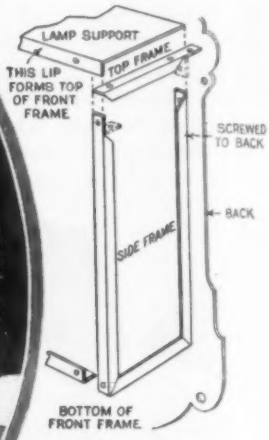


FIG. 7

pretty when the lamp is in use. When punching is finished, drill 3/16-in. holes, about 1 in. apart, all around the borders of the panels, through which the panels are later soldered to their frames, and pull the panels off the board. Bend to a U-shape, keeping the rough surfaces inside.

The frames for the panels are cut, bent and bolted to the back with the machine screws, as shown in Fig. 7, in which it will

be seen that one long strip of the angle brass is cut and bent to form a U-frame on each side. The top of the frame on each side is formed by a short piece of angle, the bottom of the front frame by another short length, and the top of the front frame by the bent-down lip of the lamp support shown in Fig. 11. All parts of the frame are fastened together with copper rivets. Before fastening the frames to the back, set the panels in place in them and tack the panels to the frames with solder through the holes. Put the frames in place, screw them to the back, then fit the porcelain socket to the lamp support, and fasten it above the frames, attaching it to the latter and to the top of the front panel with a couple of rivets in each part. Connect the wires to the socket and run them out through the hole in the back drilled for this purpose.

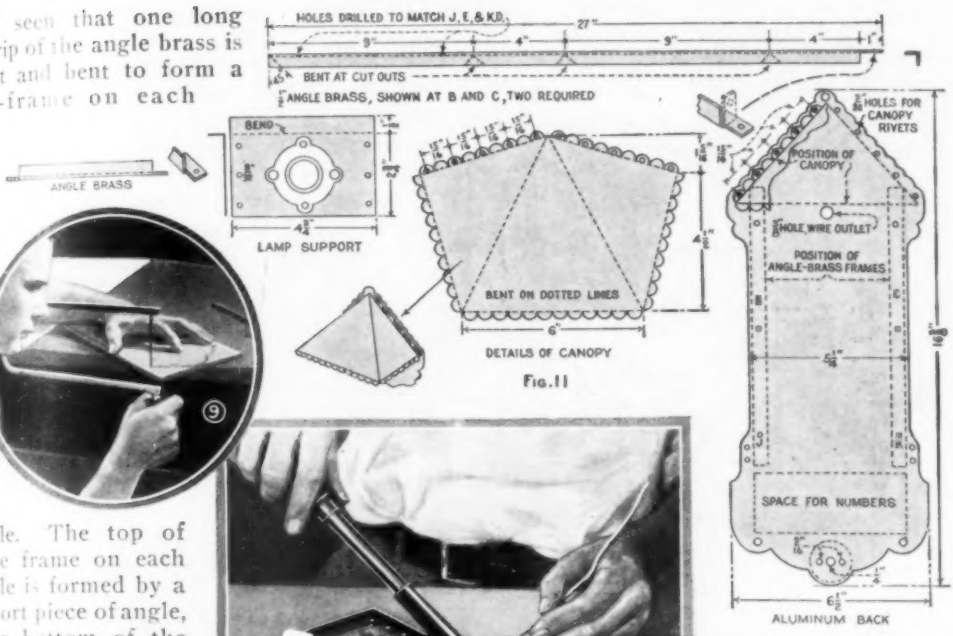


Fig. 11

The canopy for the top is cut from the 6¼ by 9-in. copper sheet. It is laid out as shown, so that, when bent to shape, it will fit over the frames with about ⅝-in. projection all around. Cut the scalloped edges as shown, drill through every other scallop along the edges of the top for rivets to attach it to the back, then bend to shape and fasten in place. The scallops on top are bent up, as may be seen in Fig. 1, and the scallops around the edges of the frame bent down. See that the canopy is square before riveting in place. Use ⅛-in. rivets, ¼ in. long.

Cut out the 1-in. strip of copper to form the scalloped gallery around the lower edges of the frames, bend to shape and fasten to the lower end of the side frames as indicated in Fig. 5, using machine screws and the two pieces of brass tubing as spacers. Fasten the ends of the gallery by bending behind the back and riveting.

Cut out your house numbers from aluminum or brass, or buy them ready-made, if you can find any of suitable size. Rivet them in place on the base, and file the rivets flush with the surface. Mount the bell button with screws from the back.

A small rectangular piece of so-called art glass can be slipped into place on the bottom of the lantern, as shown in Fig. 5, and will diffuse the light thrown down on the numbers. The lamp is put in place before this is fitted. If there is an inside switch fitted for your porch lights, the lantern can be hooked in on the same circuit; if not, you will have to fit one, or the local electrician will do it for you for a small charge.

¶Never attempt to stop a machine by grasping the belt.

This Mixer Simplifies the Work of Mixing and Distributing Wet Mash

Wet-Mash Mixer for the Poultry Raiser

For mixing wet mash, a western poultry raiser uses a 3 by 5-ft. mixing box having a curved bottom, made of fairly heavy galvanized sheet iron. The greatest depth of the box is 10 in. and the legs are made of 2 by 4-in. stock, while the lower edge of the sidepieces is curved. A V-shaped piece of wood is fastened onto one end of the box to prevent the mash from slopping over the center when the buckets are being filled by pulling the mash over the edge with a hoe. The legs are braced with crosspieces, and a platform for the buckets is provided as shown.—Kenneth Stoever, Riverside, Calif.

Adjusting Ford Model-A Steering Gear

On the latest model-A Ford cars an adjustable steering gear is provided so that end play can be eliminated without the need of new parts. When the gear becomes worn to the extent that there is about one-eighth of a turn play at the steering wheel, the plate on the inner side of the housing and the arm on the outer end of the sector shaft are removed, after which the shaft can be taken out by pulling it toward the motor. The steering wheel is marked with a pencil and is then turned halfway around to present a new surface on the worm. The wheel is pulled up to find the end play on the steering shaft. This is taken out by removing the light switch and plate on the lower end of the housing and leaving out one or more shims. The plate and light switch are then replaced. A piece of thin brass or steel is cut about 1 in. wide and is laid in the bottom of the sector shaft. The bushings and the shaft are put back in place, as are also the arm on the outer end of the sector shaft and the plate on the inner side of the gear housing. The end play in the sector shaft is taken up by the setscrew and locknut on this plate.—E. T. Gunderson, Jr., Humboldt, Iowa.

Double-End Stamp Saves Time

Often work must be stamped in two places with the maker's trade-mark and number. Most plants are able to make their own odd stamps, and for those who do, the double-end stamp shown in the drawing will be of considerable usefulness, as it saves the trouble of picking up and putting away two separate stamps, and further, shows the correct method of holding it at a glance. It can be made in one piece, or two separate pieces can be welded together. An angle of about 45° has been found most suitable as it presents a better surface for the hammer.

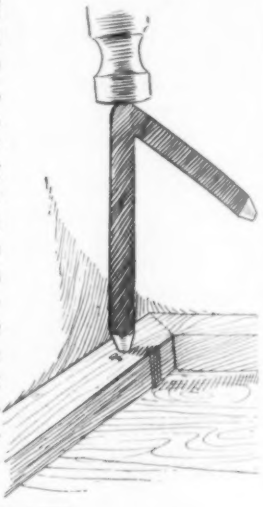


Plate Glass for Turning Fiber and Hard Rubber

A tool that turns fiber, hard rubber, bakelite, pyrolin and other cellulose material can be made from a piece of broken plate glass. It must be held in a special clamping type of holder that any shop man can easily make. The edge stands up remarkably well under temperatures of high-speed cuts, but the action is scraping rather than cutting.

EXPERT ADVICE ON THE USE OF SILVER SOLDER

Silver soldering is a simple operation, so simple, in fact, that even experts often become careless and expect too much of the solder. Just as soon as any part of the process is neglected, results become unsatisfactory, and the solder is blamed, when the method is usually at fault.

Illustrations Courtesy Handy & Harman

Fig. 1

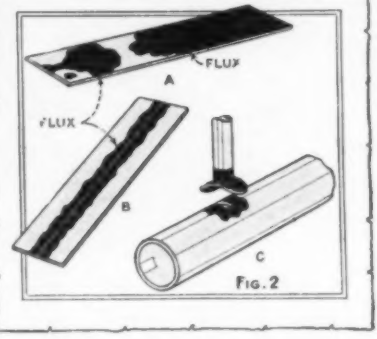


Fig. 2

The first requisite in silver soldering, as in ordinary soldering, is that the parts to be joined must be cleaned thoroughly. Dirt and grease must be removed mechanically or chemically. Then the edges of the joint should be smooth, and made to fit tight. It is not only wasteful of the solder to use it as a filler, as shown in the joints marked "bad" in Fig. 1, but such methods do not result in good, sound joints. The proper method of fitting joints is also shown in Fig. 1. For general soldering work, borax, dissolved in hot water to make a saturated solution and used hot, makes a good flux. For stainless steels and other metals forming oxides which are hard to remove, use a paste made of 1 part borax and 1 part boracic acid mixed with a zinc-chloride solution. Use plenty of flux, covering all of the joint and the solder itself. Dipping the parts in the flux does not always result in complete coverage as the flux may be spotty, as shown at the left in A, Fig. 2. Use a brush to cover the surface thoroughly, as shown at the right in A, and in B and C, Fig. 2.

If expertly handled, an oxyacetylene torch is usually best for silver soldering. The flame is intense, however, and must not be kept concentrated at one spot, as shown at A, Fig. 3; it must be kept in motion over the whole joint as at B. Heat the joint and the surrounding metal slowly before soldering, regulating the torch to a soft flame so that the flux will not be blown off. Preheating adjoining parts will reduce heat radiation away from the joint itself. Special attention must be paid to this point with copper, as this metal is a rapid conductor of heat, and when joining different metals, the one that is the best conductor should be favored in the preheating. This is also true when joining different thicknesses; the heavier one should be thoroughly preheated.

When the joint shows a dull red, concentrate the flame at full pressure along the joint, judging the temperature by the color. The first visible red is at about 900° F., dull red about 1,200°, cherry red about 1,400° and bright cherry red 1,600°. A good silver solder melts at from 1,325 to 1,600°. Borax becomes fluid at 1,400° F., forming a good guide. At the melting

point of the solder, bring it under the flame, when, if the parts have been properly fitted, fluxed and heated, the solder will flow quickly along the joint, following the flux as though pushed. If the solder "balls," as shown at the left, Fig. 4, this is an indication of insufficient heating or poor fluxing, usually the latter.

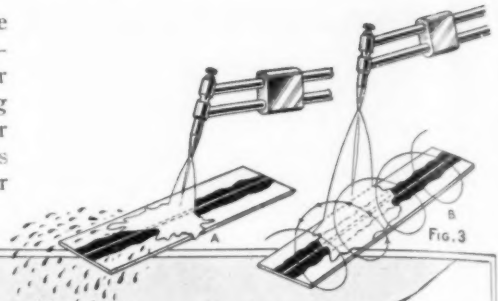


Fig. 3

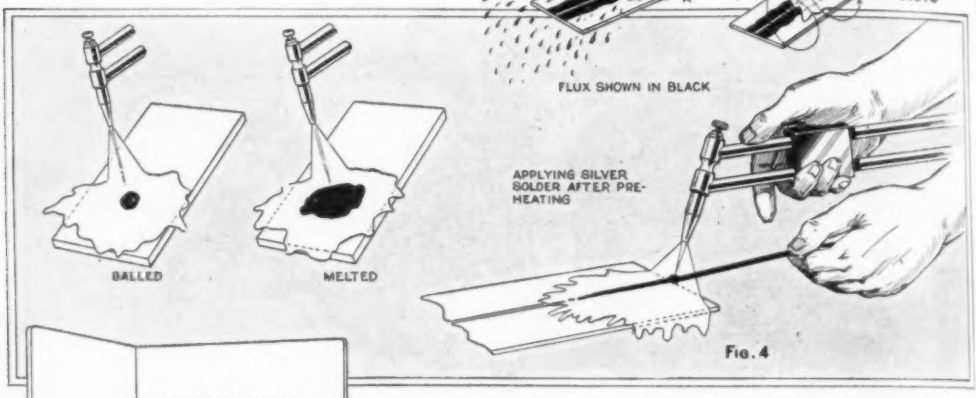


Fig. 4

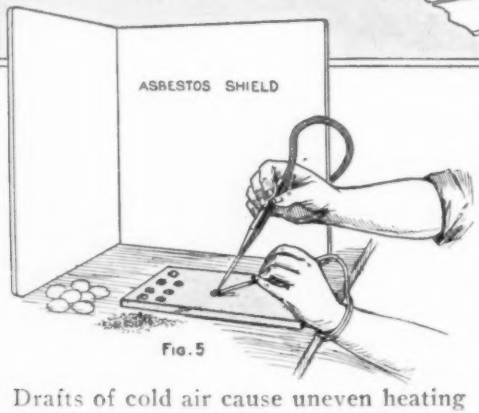


Fig. 5

Drafts of cold air cause uneven heating by cooling one part more than the other, and are easily prevented by using a shield, as shown in Fig. 5. If pinholes are found in the finished joint, these may be caused by improper fluxing, dirt, oil and either over or underheating.

Oxygen-and-gas or air-and-gas torches also give good results, especially on small parts. On large parts the preheating takes longer with these torches than with oxy-acetylene, but, on the other hand, there is less danger of melting the parts.

Tanning Rabbit Skins

Rabbit furs can be made up into garments or used for garment linings, as well as for the trimmings on muffs and other fur pieces. Most attempts at tanning these skins have not been very successful, but the following process has been found to give satisfactory results: First, the flesh side of the hide is gone over and all possible flesh is removed by scraping, great care being exercised against cutting through the skin. After scraping, rub in salt, roll up the pelts, and put them away for 24 hours. A solution of ½ oz. of sulphuric acid, 2 lb. common table salt, 4 oz. powdered alum, and 5 gal. water is mixed in a large container. After the ingredients have been thoroughly dissolved, the mixture is stirred and the hides placed in it. The container is covered and set away. The hides are allowed to remain in the solution for nine or ten days and should be stirred around two or three times a day during this period. When the hides are removed, they are washed with warm water and soap, this process being repeated two or three times. The hides are then tacked out and stretched, and the flesh side wiped dry with woolen cloths. When dry, the flesh side is gone over with fine sandpaper, using care against rubbing too deeply. This completes the process, and the hides are ready to be cut and worked as desired.

¶ For every 10° F. added to the temperature of feed water by exhaust steam, nearly one per cent of fuel is saved.

Drilling Holes in Rubber

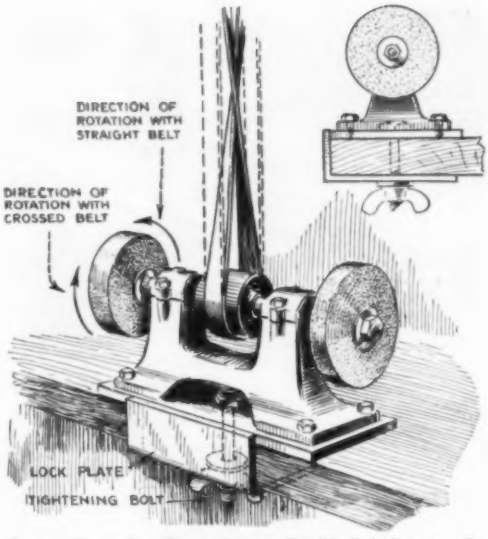
After attempting to drill holes in thick rubber with a carpenters' bit and a twist drill without success, I made a hollow punch to be driven through with a hammer, but the punching came out shaped somewhat like an hour glass, and the hole was the same form. I then held the punch in the lathe chuck and pressed the rubber against the rotating punch, using water as a lubricant. The result was a clean-cut hole of an even diameter all the way through. Rubber washers were also made in a similar way. By first cutting the hole and then pressing the piece on an arbor, the outside cut could easily be made with a jackknife, the back of the blade being supported by means of a piece of iron held in the toolpost.—M. L. Lowrey, Livermore, Calif.

Straw Loft for Hog House

It has been found that a straw loft in an A-type individual hog house will keep the interior about 25° warmer than the outside temperature, and will be from 10 to 20° warmer than a similiar house without a loft for the same number of hogs, according to tests made by the Kansas state agricultural college. The loft may be added to an A-type house by attaching wire mesh to the rafter bracing. On this mesh, a 9 by 10-in. layer of clean straw is loosely placed. To pack in the straw tightly would interfere with ventilation

Straw Loft in A-Type Hog House Keeps Inside Temperature Higher

and decrease moisture absorption, so it should be inspected and renewed regularly.—L. N. Merwin, Beaver City, Nebr.

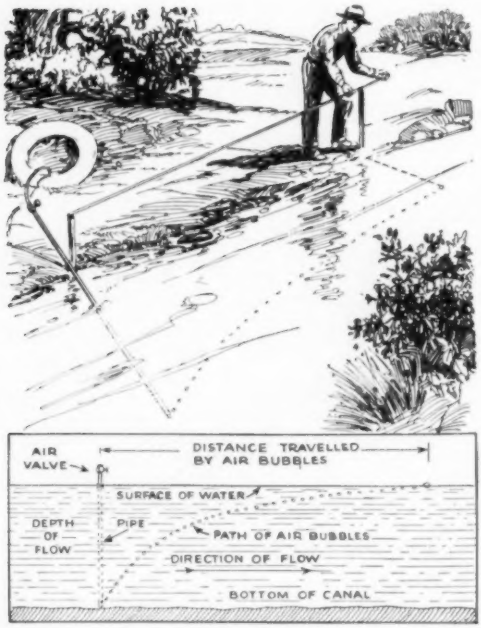


Arrangement for Reversing a Small Grinder on the Workbench

Reversible Hand Grinder

Ordinarily, small grinders that are made to be attached to a bench cannot be used from the rear. Since tool grinding can often be better done with the wheel turning away from the operator, one shop rigged up a small grinder so that it could be turned around in a moment. It is mounted on a hardwood base, drilled in the center for a bolt which passes through the bench top and is tightened by means of a wingnut. A steel lock plate, bent at right angles, is also provided. When it is desired to grind a tool on a wheel turning away from the worker, the wingnut is loosened until the lock plate drops down far enough to clear the base, after which the machine is swung around and the nut is tightened again, the lock plate holding it in position securely. When the machine is swung around as just explained, the belt becomes crossed, reversing the direction with respect to the tool being ground, but, as the whole machine is turned there is no danger of the nuts working loose.—Harry Moore, Montreal, Canada.

¶A number of different sizes of setscrews, which have cupped ends, make good rivet sets when regular sets are not at hand; pick out a size that fits the rivet, and a neat job will result. The square heads are easily gripped in a vise.



Compressed Air Aids in Measuring Flow of Water in Canals and Flumes

Measuring Water with Air

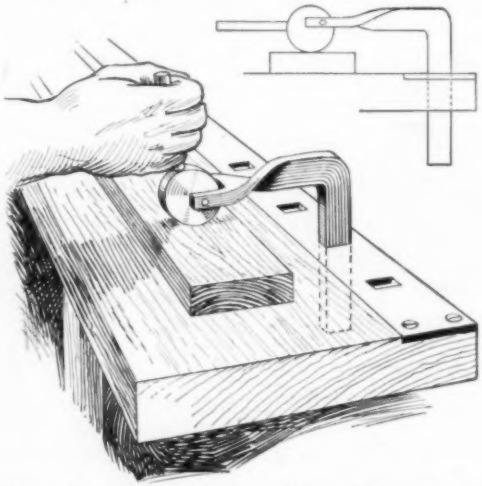
With the aid of compressed air it is possible to measure the quantity of water flowing in small canals or flumes. The air is released at the bottom of the canal and the time when the bubbles appear at the surface of the water and their location at that moment are carefully noted. The total quantity of water flowing can then be computed from the distance that the bubbles travel downstream while rising to the surface and the time spent in rising. The distance in feet, divided by the time in seconds, equals the velocity of water in feet per second. The velocity multiplied by the area of the cross section of the canal, in square feet, gives the total rate of flow in cubic feet per second. Feet, seconds and square feet are the units usually used, but, of course, other units may be used. One cubic foot per second equals 7.48 gal. of water per second, or 448.8 gal. per minute. As the water near the surface of the canal flows more rapidly than that near the bottom, the path of the bubbles will be curved as shown in the illustration.—Ivan E. Houk, Denver, Colo.

Straightening Spring Bumpers

Auto bumpers that have been bent slightly can often be straightened without tools by placing them on two blocks of wood and then lowering one of the car wheels on the bent portion, the wheel having been jacked up for this purpose. The blocks are placed several inches on either side of the bend in the bumper, and the weight of the car will do the work nicely.—E. T. Gunderson, Jr., Humboldt, Iowa.

Eccentric Bench Clamp

Although rather unusual in design, the bench clamp shown in the drawing has been found highly useful. A piece of heavy bar stock is bent at right angles and the end given a quarter twist as indicated. This end is recessed to take a small steel wheel, through which a hole is drilled eccentrically, for the mounting pin. A handle is provided on the edge of the wheel for locking the clamp. For the upright part of the clamp a series of holes are cut through the benchtop near the edge, as shown, so that the worker can use the clamp at various places. A steel plate with corresponding cut-outs should face the benchtop along this edge. When the handle is turned down to bring the eccentric wheel in contact with the work and wedge it, the other end binds in the hole.—C. H. Willey, W. Concord, N. H.



Unusual But Efficient Bench Clamp Makes Use of Eccentric Wheel for Wedge

Junior Electric Stove Is Easy to Make

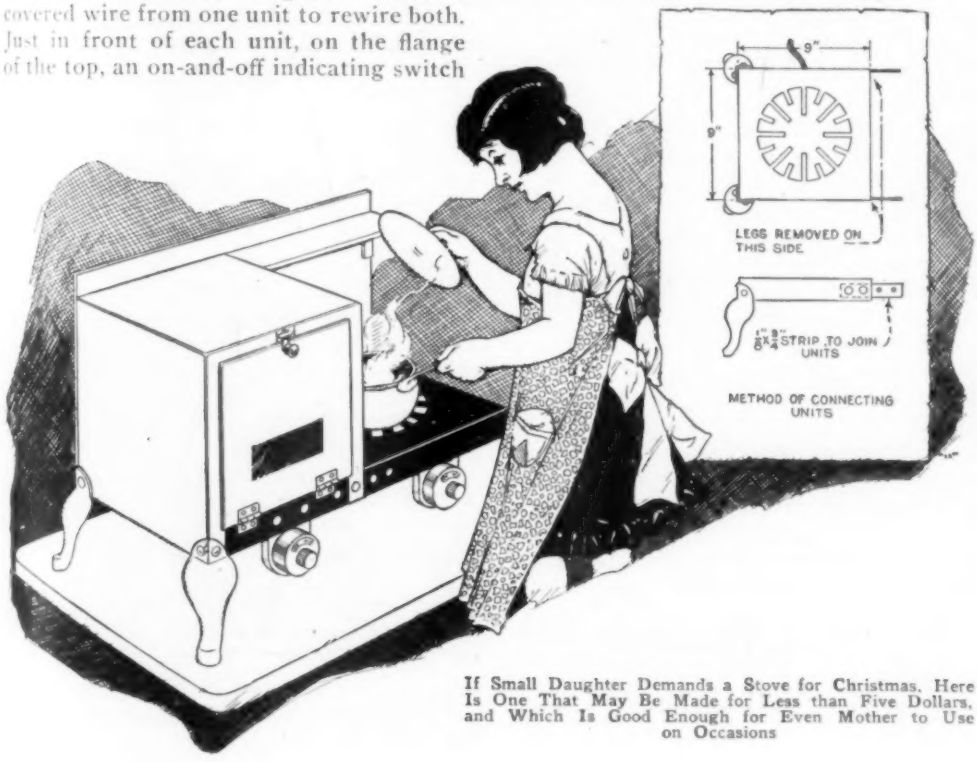
By IRVIN L. MORROW

LAST year Santa Claus had a call for an electric cookstove at our house, and small daughter insisted that nothing else would take its place. Investigation soon revealed that what the market afforded was either too expensive or too shoddy and impractical, so it was distinctly up to the handy man. At a very nominal cost and in a few hours, I made a stove that not only meets the demands of the youngster, but also is often of use to mother.

The foundation of the stove was two ordinary electric-heating units at $1 apiece. These come equipped with short legs, and were joined together to make a "two-hole" stove top simply by removing a pair of legs on each unit and then bolting the units together. A strip of ⅛ by ¾-in. iron was bolted across the joints, front and back, to strengthen the assembly, as shown in one of the drawings.

The units were then rewired as shown in the diagram, so that a single outlet cord could be used, using the asbestos-covered wire from one unit to rewire both. Just in front of each unit, on the flange of the top, an on-and-off indicating switch was mounted, using as bases the ¼-in. blocks shown in the detail. The bases were fastened to the flanges with small bolts.

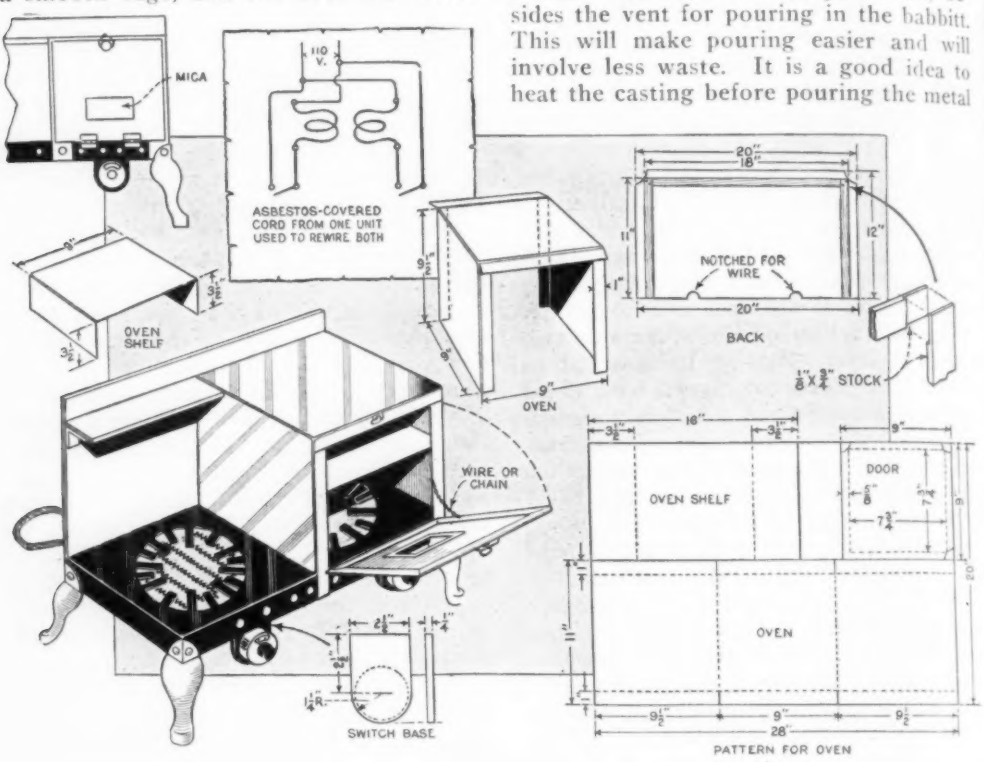
Two sheets of block tin were then obtained, one 20 by 28 in. and the other 14 by 20 in. The legs and trimmings on the units were nickeled, and by using the bright block tin for the oven and back, the whole job matched up and looked very well. The shape of the oven, oven shelf and door was laid out on the larger piece and the back on the other. They were then taken to the local tinner, who charged 25 cents for cutting and bending them to shape, as shown in the detail drawings. The back was strengthened with three pieces of the ⅛ by ¾-in. strap iron, half-lapped at the corners and projecting at the bottom so that the whole back could be bolted to the rear flange of the units. A frame of the same material was bolted to the front of the oven, as shown, and this was bolted to the front flange.



If Small Daughter Demands a Stove for Christmas, Here Is One That May Be Made for Less than Five Dollars, and Which Is Good Enough for Even Mother to Use on Occasions

The edges of the door were folded back on themselves, to add stiffness and to make a smooth edge, and the door was fitted to the oven with two ½ by 1-in. hinges. A five-cent pan-lid knob made a neat handle for the door, and a short piece of fine chain a stop to hold the door horizontal when opened. The mica "window" in the door is a refinement that may be omitted if desired. The shelf on the back was made from scrap.

The total cost of the stove, including the bending of the tin, was $4.40. As indicated in the sketches, the stove may be made either right or left-hand, no change in construction being involved. Electric units of the type shown can be obtained in most dollar stores, and those in which the legs are attached by means of bolts should be chosen rather than those in which rivets are employed.



Hints on Babbitting

When babbitting, heat the metal until it will ignite a light pine stick, but be careful not to increase the temperature beyond this point as this is likely to injure the babbitt. Also remember to provide a suitable vent for the escape of air, besides the vent for pouring in the babbitt. This will make pouring easier and will involve less waste. It is a good idea to heat the casting before pouring the metal for two reasons: In the first place, this prevents the babbitt from being chilled and, in the second place, it reduces the amount of shrinkage from the intended size, which makes for better fit with greater accuracy. Small castings can be heated in a fire but it may be necessary to use a blowtorch on large ones. Allow plenty of head for the mold to draw from, especially on large jobs, in order to avoid a shrink hole, which often forms at the top. Removing old babbitt from boxes can best be done by setting the box in the fire and melting the babbitt out, but when this is done, do not cool off the box by immersing it in water. It should also be kept in mind that water be kept away from molten metal, and the molds perfectly dry before using in order to prevent spattering. When a mold is heated as already suggested, this trouble will be eliminated. Goggles should be worn as they provide the best insurance for the eyes when pouring.

Foot-Operated Wire Stripper for the Electrician

Radio and electrical shops that are frequently called on to strip the insulation from lengths of wire conductors and cables, can lighten this task and save much time by making the simple foot-operated wire stripper shown in the drawing. The stripper consists of a piece of channel iron to which a lever, made from an old file, is pivoted at one side. A sharp, triangular notch is cut in the lever to cut the insulation. A similar notch is cut in a piece of flat iron, which is bolted to the channel piece as indicated, a hole being drilled through the latter, directly behind the notch, to allow the end of the wire to project. In this way a shear is formed, which cuts the insulation at four points as it closes. To prevent the shear from cutting deeper than the thickness of the insulation, an adjustable stop screw is provided. A length of ¼-in. iron rod connects the movable jaw to a wooden treadle hinged to the floor, which makes it possible for the operator to use both hands in twisting the wire while closing the shears. A coil spring opens the jaws as soon as pressure is removed from the treadle.—Charles M. Willey, West Concord, N. H.

Quick-Action Wire Stripper for the Electrician Is Operated by Foot

Standing Platform Attached to Small Portable Pipe-Threading Bench Holds It Securely

Pipe-Threading Bench

Pipe fitters often have a light bench fitted with a pipe vise which they carry along from one job to another. As the bench is small and necessarily light, it has a tendency to slip around and tip under the strain of threading and cutting. One method of overcoming this trouble is to hinge a small standing platform to the two front legs of the bench as shown. The weight of the worker on this platform will hold the bench in place. The platform is folded against the bench and hooked when moving to another job.—Harry Moore, Hamilton, Can.

Lubricant for Lathe Center

A small quantity of powdered mica, added to the usual mixture of white lead and machine oil, will be found to greatly increase the lubricating qualities of this mixture, which is applied to lathe centers. The mixture has also been found better than oil for lubricating the steady rest.—Ernest Romkee, Colorado Springs, Colo.

¶An ordinary paper bag can be waterproofed by immersing it in a solution of paraffin and gasoline and then squeezing out the surplus liquid by running the bag through a wringer.

Floor Oiler for Janitors

This Floor Oiler Lightens the Task and Also Affects a Considerable Saving in the Oil Applied

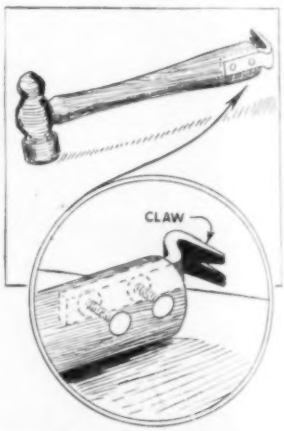
Oiling floors in a large school was made easier by using the homemade machine shown in the illustration. It consists of a 1¼-in. block, which measures 4 by 12 in. Strips of light wood are nailed to the edges to form a shallow box. Another piece of 3/16-in. wood, fitting inside, is used as a base for attaching strips of felt, which are glued to it edgewise. A 3-qt. oil tank of the cylindrical type is fastened to a suitable handle which is hinged to the top of the block, as indicated, and a length of ⅛-in. brass tubing, attached to the bottom of this tank, conducts the oil to the brush, the flow of oil being controlled by means of an adjustable valve. A hole is drilled through the block to receive a length of flexible metal tubing, which is soldered to the oil pipe and to a length of perforated brass tubing, running across the underside of the block. The base of the brush is drilled in a number of places, or a slot is cut to allow the oil to run through the felt and onto the floor. Then the brush is set in place and fastened with nails driven through the side strips. For gluing the felt strips it is necessary to use a water and oil-proof glue so that they will not loosen when they become saturated. It has been found that the oil is distributed evenly with this brush, and that there is little or no waste. Compared with the old method of using a mop to distribute the oil, the economy of this brush is evident from the fact that only 8½ gal. were used on a space formerly requiring 34 gal. Another point in its favor is that clean oil is always applied.—J. Edw. Tufft, Boulder, Colo.

Brake for the Lathe

In cases where it is necessary to stop a lathe often, as in piecework, where time means money, a quick-acting brake will be found useful. Take a small piece of leather belting, rivet one end to make a loop over the shaft so that it makes a sliding fit, and let the other end hang over one of the steps of the cone pulley. Apply a little "belt stick" or friction compound on the inside so that a slight pressure on the loop will cause the lathe to stop immediately. In an eastern factory, all the lathes were equipped in this manner, after tests had convinced the management of the practical value of the brake.—Charles R. Whitehouse, Boston, Mass.

Claw on Hammer Handle Found Useful

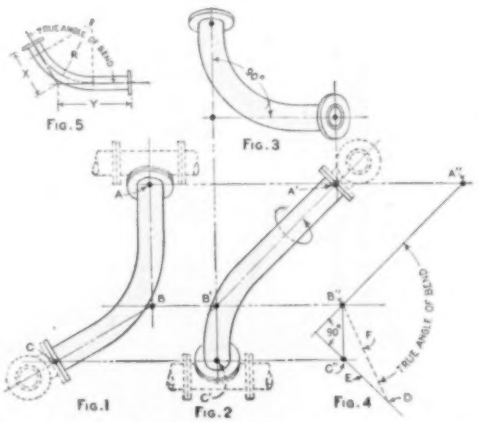
Many mechanics who do not carry a claw hammer in their tool kit, depending instead on their pliers and screwdriver for prying up brads, pins, etc., will find a simple claw attached to the handle of an ordinary hammer more useful. The claw is made from a section of an old file, heated and hammered to the shape shown, after which the edge is ground to a bevel, a notch filed in the center of this edge, and holes drilled and countersunk for flat-head screws by which the claw is fastened. It is advisable to cut a groove in the handle end so that the claw will come flush with the wood.—G. A. Luers, Washington, D. C.



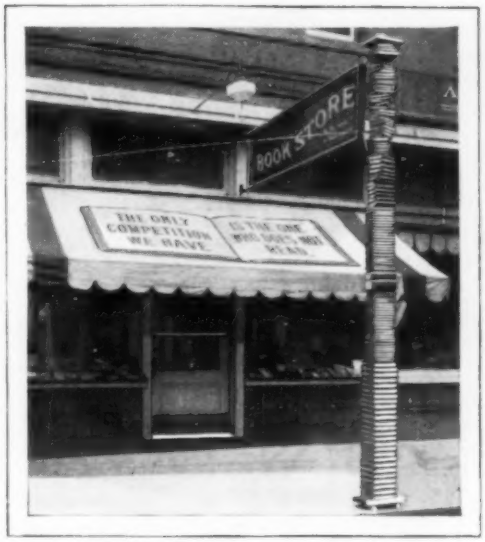
Determining True Angle of Bends

Often a practical problem comes up in the drafting room or shop when it becomes necessary to determine the true angle of a bend as, for instance in a large iron pipe whose bent parts do not lie in the same plane. In Fig. 1 is shown a pipe dropping forward at an angle and sloping off to the left at another angle. Fig. 2 is a right elevation of the same pipe, while Fig. 3 is a plan view. Only part, or one end of the pipe in its true length, is shown in Fig. 1, while Fig. 2 shows the other part. By combining these two views, the true angle of the bend may be obtained. If that part of the pipe in Fig. 2, which is shown in its true plane, is rotated about its center line, in the direction of the arrow, until the other part lies in the same plane, then its true angle will be shown. Fig. 4 shows a method of measuring to obtain the true angle by the use of this principle. Locate points A″ and B″ the same distance apart and on a line having the same angle or slope as A′B′ in Fig. 2. Lay off the distance between points B″ and C″ in the same way. Now draw a line through point C″ at right angles to line A″B″, as marked at E. Take a radius equal to the distance between points B and C, Fig. 1, and use point B″ in the diagram as a center. Swing it through line E, intersecting this line at point D. Connect points B″ and D with a straight line F, when the true angle is as shown. The above description applies only in cases where the angle shown in Fig. 3 equals 90°, which is quite usual, and the layout should be on as large a scale as possible. In Fig. 5 the dimensioned pipe is shown equaling distance BC in Fig. 1, while Y equals distance A′B′ in Fig. 2. The radius R is made of a length suitable to the case.

Before starting a machine, look it over to see that it is properly oiled, and that it is in good condition.



Here Is a Method of Determining Angle of Pipe Bends without Resorting to Mathematics



"Totem Pole" Consisting of 161 Books Makes an Unusual Bookstore Attraction

Bookstore "Totem Pole" Attracts Custom

Containing 161 books, this "totem pole" has been found unusually effective in attracting customers as it stops two out of three passers-by. It consists of a pipe on which the books are "strung," a hole being cut through each book, which was done by means of a curved chisel after the size was marked on the cover with an expansion bit. A pipe flange and cap were screwed on the projecting lower and upper ends of the pipe, and the lower end was imbedded in a concrete base, the pipe being fitted loosely in the concrete so that it could be removed when desired. To present a better appearance, a wooden block was placed under the bottom book. The pole is 13½ ft. high, and, as it weighs 300 lb., can be lifted out of its place by two men. Several coats of heavy spar varnish were applied to both pipe and books to afford protection against the weather. —Bert Barber, Fort Worth, Tex.

Belt Sander

FOR effectively sanding a fine, true finish on large surfaces and for working out rounding contours and sanding to size on small, delicate parts, the belt sander has certain eminent advantages over other types. A top-notch finish on fine cabinet woods is possible only on a carefully sanded surface. The machine described here has been found capable of sanding a great variety of work easier, faster and better than one could hope to do by the best possible hand methods.

The base is constructed of ¼ by 1¼-in. angle iron, joined with ¼ by 1-in. stove bolts. For the frame complete we need: eight pieces ¼ by 1¼-in. angle iron, four 29¾ in. long and four 30 in.; one piece ¼ by 3 by 16-in. flat iron; 1 piece ⅛ by 1 by 60-in. flat iron; 1 piece ¼ by 4 by 8 in. and 1 piece ¼ by 1¼ by 60-in. flat iron. These pieces are cut off square at both ends to the over-all lengths indicated in Fig. 2. Use a rule, try-square and sharp slate pencil when laying out.

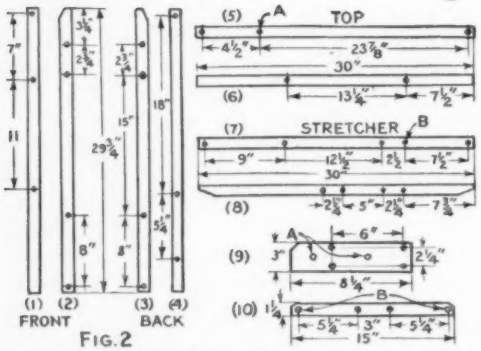
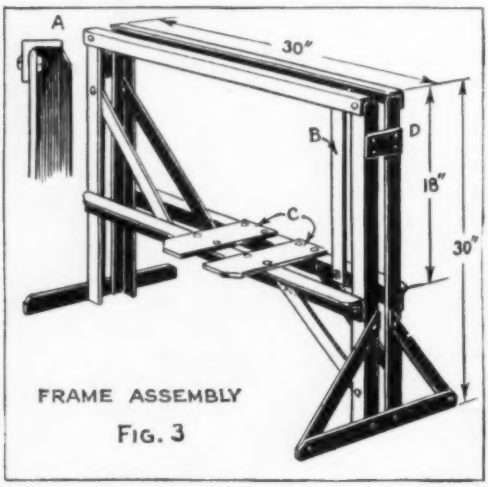


FIG. 2

Figure 2 dimensions one each of all parts of the base save the small end plates, the frame braces and the two short braces on the back cross support or "foot." The details 1, 2, 3, 4, 5, 6, and so on, in Fig. 2 show two adjacent sides of the one piece and are for the purpose of showing the location of the necessary holes. All parts shown in Fig. 1 are duplicated save the location of several holes mentioned later. Fig. 3, A, shows how the uprights are joined to the top horizontals. Hole A in piece 5 and B in piece 7, Fig. 2, are drilled for bolts holding the piece B in Fig. 3, to which is fastened the safety switch in the motor line. The holes indicated at A on part 9, Fig. 2, are those for the motor bolts and should not be bored until the plates are bolted temporarily in place on the frame. Those at B on part 10 are drilled at the ends of only the one piece. It should be remembered also that the size of the motor and the length of the drive belt will affect the location of the motor-mounting plates



FRAME ASSEMBLY

FIG. 3

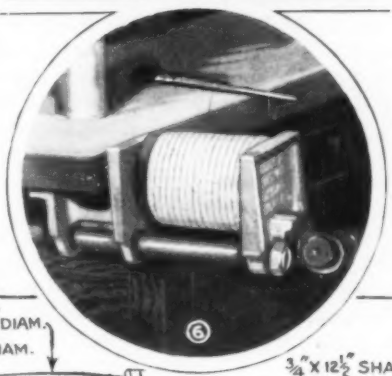
Reduces Labor

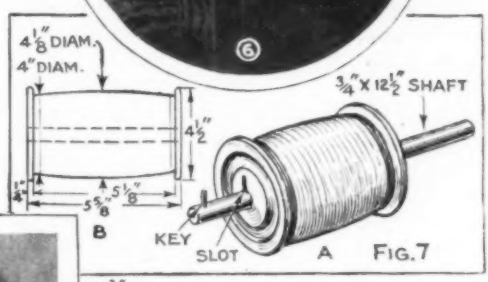
by W. Clyde Lammey

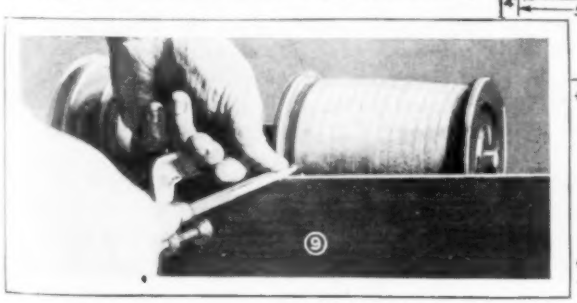
C in Fig. 3. It is best to drill holes for the assembly of the frame first, leaving the drilling of the holes in question until a trial assembly of the frame is made, when the location of these holes can be accurately determined.

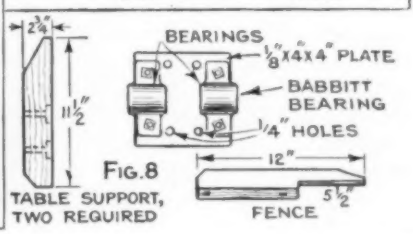
Assemble the frame by first bolting the ends of the top horizontals to the uprights. Then bolt the lower stretchers and the crosswise foot in place at each end. Draw down all nuts on spring lock washers. Cut the ends of the lengthwise braces at an angle for neater fit, drill with a hand drill and bolt in place, as shown in Fig. 3. Brace the one foot at the rear of the frame, as shown. Cut to length and bolt the switch support B through the holes already drilled in the frame. Lastly, cut the end plates D, Fig. 2, to 4-in. length from the ⅛-in. stock, drill and bolt to the ends of the frame.

The bearings which carry the rollers on the machine shown are those used on a well-known make of small bench bandsaw, are bushed with bronze sleeve bushings, with an oil reservoir between them, and fit a ¾-in. shaft. If these are unobtainable, get four ¾-in. babbitt bearings, preferably those cast from solid babbitt metal,









and bolt two of these to a ⅛ by 4 by 4-in. plate for the single-bearing assembly. By bolting to the plate, the bearings are held in line; the plate is then bolted to the machine frame with ¼-in. bolts. Bolt the bearing in place as close as possible to the front end, and from a piece of ¾-in. steel shafting cut a piece, 12½ in. length. Set this in the bearing with the ends projecting, cut two washers or end bushings from ¼-in. fiber to a diameter of 1½ in., and center a ¾-in. hole through each. Slip these on the right end of the shaft (looking from the rear of the machine) and set a 5-in. grooved pulley against the bushings. Put the same-sized grooved pulley on the motor shaft. Set the motor-mounting plates on the stretchers and hold them in approximate position with a C-clamp. Set the motor on the plates, aline the pulleys and put on the rubber V-belt. Draw the motor back until the belt is under reasonable tension, shift the plates, if necessary, to bring them squarely under the motor base, and mark the location of the holes for the bolts holding the motor and those in the stretchers to which the plates are bolted. Remove the plates, drill the holes and remount the motor, using heavy felt or leather under the feet. Do not make the rubber V-belt too tight.

Owing to the projection of the rollers beyond the bearings, there is a tendency to vibration when a wooden roller is used, due chiefly to the weight. To overcome this, the rollers are turned from 3/16-in. wallboard disks with a ⅝-in. hard maple cap glued to each end. The glued-up rollers may be turned out in any small lathe with the ordinary turning tools, and it may be said that nothing better for the purpose could be made in the home shop, as the rollers are light and strong, and the paper faces make a friction surface on which the sand belt will never slip under the heaviest load.

Twenty-two 4¼-in. disks are required for each roller, and these are cut from beaver board on the jigsaw, Fig. 4. Four disks are also cut from seasoned hard maple, two 4¾ in. diameter and two 4¼ in. Be careful to saw all disks reasonably accurate. Glue these up by stacking one on the other, Fig. 5, with the wooden cap disks glued to the ends, and clamp in the bench vise as in Fig. 6.

When gluing up, it is very important to have a good glue joint between each of the disks, or the roller will not stand up under the severe strains to which it is subjected. Do not place a spot of glue at the center and trust to the pressure to force it over the whole surface, but spread the glue evenly and uniformly over the surface of each disk clear to the edges. Put plenty of glue on each joint and use, if possible, the new waterproof casein glue now available.

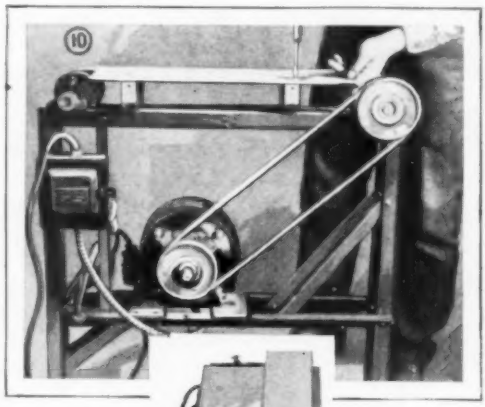
The glue dry, center the front roller in the lathe and turn down to the dimensions given in Fig. 7. The idler roller is turned to exactly the same diameter and width, but is not flanged. When turning the paper surface to size, use, if possible, a turners' spear or V-point tool, Fig. 9, and keep the edge honed very sharp. Leave the paper surface rough as it comes from the tool.

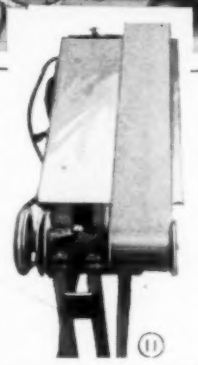
With a ¾-in. standard wood bit, center a hole from each end of the rollers. Be careful to bore as accurately as possible. The rear roller is simply idle on the shaft, but the front roller requires to be keyed as at A, Fig. 3. Drill a ⅛-in. hole about ½ in. from the end of the shaft to a depth of ⅜ in. Cut a ⅞-in. length from heavy wire and drive this in the hole, then cut a slot for the key in the end cap of the roller. Slide the roller on the shaft and turn it until the key slips in the slot, then reassemble the shaft in the front bearing, using an end bushing or washer, cut from ⅛-in. fiber to a diameter of 1½ in., bored ¾ in. and placed on the shaft between the end of the bearing and the roller. The idler shaft is cut to 11½-in. length, the roller being driven on one end until the shaft is even with the outer end of the roller. Use a fiber bushing between the end of the bearing and the roller, and set a ¾-in. shaft collar on the other end.

The sand belt used on this machine is obtained from a well-known manufacturer of belt-sanding machinery and comes 10 in. wide and 64½ in. in length over-all. When run on rollers turned to the diameters given, the distance between the front and rear shaft centers is approximately 26 in. The base of the belt is heavy cloth and will withstand many hours of the hardest service. For use on this machine, the belt is cut in two lengthwise,

making two separate belts, each 5 in. wide. It is obtainable in any of the common coarse and fine garnet-paper grits. The belt should be in hand before the rear bearing is bolted in place.

The top of the sander is a steel plate, ⅛ by 12 by 22 in., which is fastened to two wooden cross supports ripped from 1¼-in. maple stock to 2¾-in. width and 11½-in. length. (See Figs. 10 and 11.) Before ripping, however, determine the width by measurement, so that the sand belt will run flat without being raised or depressed slightly at the edges of the table.





Though not absolutely essential, it is better to have a guide at the front of the table when sanding certain kinds of work. This is made, as in Fig. 8, from a 12-in. length of ¼ by 1¼-in. angle iron a part of which is cut away as shown so that an arm will extend over the belt. The face of this guide or fence is filed smooth so that the work will slide easily, and the fence is fastened to the table at the front with small bolts.

Do not use less than a ½-hp. induction-repulsion motor to drive. Though the machine runs very easily idle, it requires considerable power when the belt is under load. A ½-hp. motor will supply ample power for any reasonable work.

It is very likely that, owing to a slight discrepancy in boring the holes for the shaft in the rollers, one or both rollers will run slightly out of true on the shaft, and if this is so, no matter how slightly, it must be corrected. This is very easily done by clamping a length of stock to the front of the frame for a tool rest and truing up the roller with the turning tool. Do the same with the idler if it wabbles, setting it in the front bearing and putting the drive pulley on the end.

Do not bear down on the work unduly when sanding. The garnet belt cuts freely and very fast. When sanding to size with the coarse-grit belt, watch that it does not take off too much and ruin the work. When sanding small delicate work, it is better to use a fine grit, as the coarse-grit belt will take off ⅛ in. in a few seconds.

Using Hand Drill as Speed Counter

A new electric motor was installed in a shop department. It soon became apparent to the foreman that the line shaft speed was much slower than it had been with the old motor. The electrician who installed it had no speed counter with him, but he picked up a hand drill which was on the bench, counted the teeth in the gear and pinion, and found that there were five times as many teeth in the large gear as in the pinion. He then put a twist drill in the chuck, and inserted the end of the drill in the center of the shaft. With his watch in his left hand and the handle of the drill in the right, in such a position that the handle on the gear would just touch his hand at every revolution, he counted the revolutions made by the handle in a minute. Multiplying this by five gave him the number of revolutions made by the twist drill, this being therefore the speed of the shaft.

Soda Protects Shop Floor from Acids

The owner of a battery shop has found a simple method of preventing the acid of the batteries from injuring the wooden floor. He simply sprinkles ordinary baking soda over the entire area where the acid is likely to be spilled. Twice a week, the old soda is swept off and a new coat applied.—Ruel McDaniel, San Antonio, Texas.

¶Never set a plane flat on a bench so that the blade touches the bench surface.

Any Home Mechanic Can Make This Simple Wooden Saw-Filing Stand

Saw-Filing Stand for the Home Workshop

Made entirely of wood, this saw-filing stand has been found practical for the home workshop. The drawing shows clearly all the constructional details. Two uprights of 2 by 4-in. stock have a V-shaped notch cut at the upper end, according to the dimensions given in the detail. Two beveled wedges fit the notches. The saw is inserted between the wedges, and these are then driven down securely with the slotted block. An ordinary wooden box provides a good seat for the worker. —Lloyd Moore, Shenandoah, Iowa.

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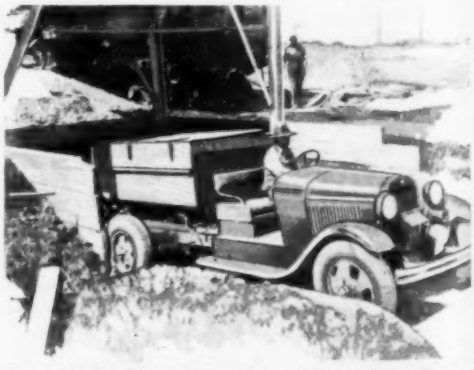
Linoleum Proves Useful to Cabinetmakers

Odds and ends of linoleum serve many important purposes in the workshop of the carpenter or cabinetmaker. It has been found useful as a covering for the workbench as it provides a smooth surface that will not scratch or mar cabinet work which is being finished. A strip applied to the sawhorse serves the same purpose. Another use for linoleum is to sharpen tools, such as plane bits and knives. After the tool has been properly sharpened on a stone, the desired keen edge can be obtained by stropping on a piece of linoleum. To make a linoleum tool strop, glue a strip of it to a long piece of wood. For veneering, linoleum has also been found useful. A piece of it is heated and laid, face up on the workbench. The veneer is then laid, face down, on the hot linoleum and glue is spread on top of it, after which the work to be veneered is pressed in place. The warm linoleum keeps the glue soft until the piece of veneer is properly seated and the clamps are applied.

Metal Cover for Truck Box

In hauling dry batches of cement and aggregates for a long distance, it is customary to cover the truck box with a tarpaulin in order to prevent loss of material from wind or rain. A more convenient method of protecting the load is to provide sheet-metal covers hinged to the sides as shown. Such covers are much



Sheet-Metal Covers Hinged to Truck Box Protect Cement from Wind and Rain

easier to handle and prove a better protection than canvas, as they are not so easily dislodged.